AMERICAN MACHINIST

A JOURNAL FOR MACHINISTS, ENGINEERS, FOUNDERS, BOILER MAKERS, PATTERN MAKERS AND BLACKSMITHS.

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Improved Machinists' Tools.

The hand-lathe represented by the engraving on this page is a late example of the notable progress made in designing and building machinists' tools during the past few years. It is built by the Brown & Sharpe Manfacturing Company, Providence, R. I. The different small parts are shown upon the floor, and designated by letters.

The spindle *a*, is hollow, having a hole of ½ inch in diameter through it. This spindle is of steel, and has a tight and loose pulley *c b*, upon it. The bearings of the spindle are of cast steel hardened and ground and are fitted into conical shaped holes in the casting, and the lost motion can be readily taken up by tightening a nut upon the end of the bearing. The bearing next to the face-plate is covered to prevent injury and unnecessary wear, caused by chips and dirt getting into it. The bearings are made self-oiling by an oil well directly under them, the oil being fed up by a leather feeder. When the face-plate *e*, is removed from the spindle, a nut *d*, is placed upon it to protect the screw from injury. A sleeve *h*, for operating the spring chuck *m*, is placed so as to be moved upon the spindle by the lever—shown extending below the table—and which is operated by the knee of the workman, by which the material being worked upon can be tightened or released, instantly, without stopping the machine.

The sleeve *h*, is secured to the spring-chuck by means of a screw, and is made to close inside the chuck by a spring *i*, which is placed inside it. The solid chuck or socket *l*, is to take the place of the spring chuck when a center is to be used as in the ordinary lathe.

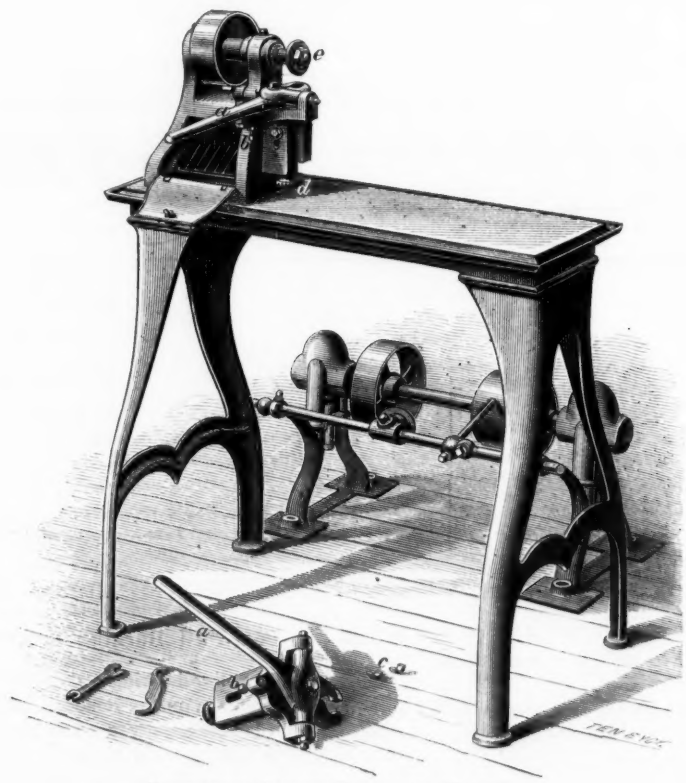
When small pieces of work are to be turned, as in the manufacture of screws, etc., the brackets *j*, *j*, are to be used for supporting and guiding the tool-bar *k*. This bar, which is turned parallel on both ends, is provided with three or more holes for holding as many different tools, which overcome the necessity of changing them frequently. This point is obvious to every one who has run a lathe. The rests can be adjusted so as to turn straight or taper. The heel of the tool is supported by the rest *p*, upon which it slides during the process of turning. The tail stock is provided with a device for holding the same to the bed, which can be operated instantly by the lever *t*. The tool rest, *p*, also has a similar device which secures or releases both the rest and the plate under it at the same time, and with one movement of the lever. Instead of the screw generally used to tighten the spindle, a lever with an adjustable fulcrum is attached to this lathe, to be used as a quick return motion in drilling, besides having other advantages.

An adjustable collar *r*, is placed upon the spindle to act in conjunction with the screw *s*, which can be used as a gauge in drilling the depth of holes and for other purposes of a like character. These machines are provided with a brace between the legs, which not only stiffen the same, but afford a foot-rest for the workman. A very convenient tool rest is placed behind the head stock to hold the necessary tools (not shown in the cut). To attempt to describe the capacity of this machine would be impossible in our limited space at the present time, as it covers a wider range of work than most of the hand lathes manufactured for common use. The machine is furnished with the necessary wrenches *n*, *o*, and other appliances by which it can be easily handled. It swings 9″ over the bed, and is furnished with two counter-shafts for varying speeds. All parts are interchangeable and are fair specimens of the work done by the company previously mentioned.

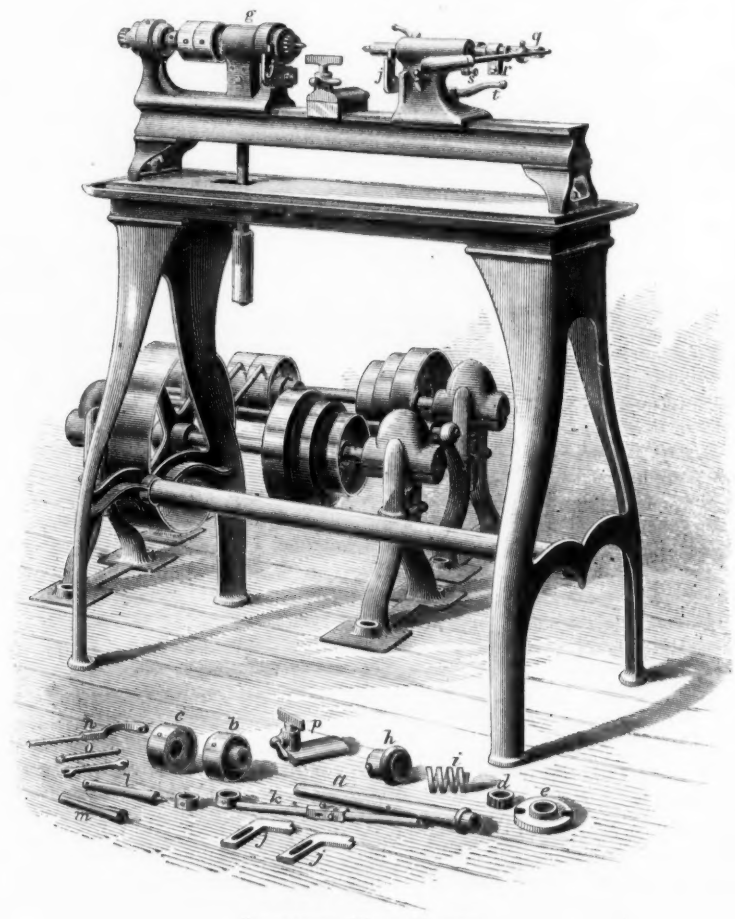
The other engraving shown on this page represents a Screw Slotting Machine, which is also built by the Brown & Sharpe M'f'g Co. The reader will at once perceive its simplicity. The spindle is of steel, with a milling tool *e*, or cutter attached to the end. The bearings, which are of conical shape, are made of bronze metal. A very ingenious device used for holding the screws to be slotted, consists of a lever *a*, the end of which forms the movable jaw of a clamp, the other being stationary, which holds the bushings, or dies *c*. This lever is pivoted, as shown, upon two screws, and, by raising and lowering the handle *a*, the head of the screw may be slotted to any depth. When the proper depth of slot is found by trial, it may be gauged by means of the screw *b*, so that every screw will be a duplicate of the first.

The spindle may be moved longitudinally by nuts attached to the bearings, in order to always bring the cutter in the center of the screw. A screw *d*, is provided by which the clamp may be adjusted up and down for screw heads varying in thickness. The lever is moved horizontally to open the jaws, and vertically to bring the head against the cutter. Duplicate bushings of all the sizes desired are fitted to the clamping jaws.

The machine is also fitted with a closet which contains separate apartments for the different bushings and cutters, and furnishes a place for wrenches and tools. An active boy can slot from ten thousand to fifteen thousand screws per day. The different parts of this machine, like the one previously mentioned, are interchangeable, and can be easily duplicated.



IMPROVED SCREW SLOTTING MACHINE.



IMPROVED HAND LATHE.

Letters from Practical Men.

MECHANICAL TERMS.

Editor American Machinist:

SIR.—The subject of mechanical terms has occupied my serious attention for many years, and I have passed through much the same difficulties as explained by Mr. W. Barnet Le Van in the AMERICAN MACHINIST, Dec. 6, 1879; and, as you kindly quoted some statements of mine in your notice on Nystrom's "Elements of Mechanics," I take the liberty to address you on the same subject.

The fancy and indefinite mechanical nomenclature, yet used in books and in institutions of learning, evidently originated when the knowledge of mechanics was in a very low state, and, having taken root, it is difficult to get rid of. It is very convenient for writers on mechanics, who do not understand the subject, to use the profound-sounding terms of indefinite meanings, but if such a writer (like the author of "Correlation of Vital and Physical Forces," published by Van Nostrand) was obliged to use terms of definite meanings, he could not write without exposing his ignorance on the subject.

The fancy mechanical terms employed by professors in institutions of learning are not used in the machine shop, for the reason that they have no definite meaning; namely, Vis Viva, Quantity of Moving Force, Mode of Motion, Mode of Force, Moment of Activity, Living Force, and a great variety of Energies, which terms are of no practical use. Whenever I meet with these terms in print, or hear them in lectures, I am very skeptical as to the soundness of the author. The professor's favorite term, *Energy*, with different appellations, is

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promiscuously used to denote either Force, Power or Work, which three quantities—particularly the two last named—are rarely distinguished from one another.

Some time ago, I procured a work on the "Mechanical Theory of Heat," with the expectation to learn something on that subject, but, to my disappointment, found the work of no practical use. The second chapter commences as follows: "It is necessary to the comprehension of our subject, that the fundamental laws of mechanics be well understood," while I have not been able to find a single expression in that book that would indicate that the author himself understands the fundamental laws of mechanics, but plenty of arguments which prove, positively, that he does not understand the same. Yet this work is the production of a professor in a University, and students are required to learn it.

The true fundamental laws of mechanics are those laid down by Nystrom, and upon that foundation I feel safe in writing upon the subject, and I defy any institution of learning to upset those laws.

The fundamental elements and functions of mechanics should be taught in all public schools, and thus imprint them upon the mind of youth, to understand the difference between Force, Motion, Power and Work.

The Keely Motor was said to have an enormous power of many thousand pounds to the square inch, whereupon men of college education subscribed freely, and hundreds of thousands of dollars were raised and expended to find that there was no power in it, but only static force, as indicated by the original expression.

The deplorable state of knowledge of mechanics in institutions of learning is exposed in Nystrom's pamphlet on "Principles of Dynamics," published in 1874.

WM. DENNISON,
Engineer,
McNeal's & Archer's Pipe Works, Burlington, N. J.

DEVICE FOR PLANING DIES.

Editor American Machinist:

I send you the following sketch, thinking it might be of interest to some of your readers.

This is not patented, and I have no axe to grind.

Some time ago, having occasion to plane a number of dies to a concave form, I devised the following device for this purpose.

As far as I am aware it is new. It may be adapted to plane a number of irregular shapes if the curves are not too abrupt, or at too great an angle to the movement of the table of the planer.

A rough outline of the arrangement is given, which any planer man will understand at a glance.

To the table of an ordinary planer is bolted the end of a wide, stiff spring, a small block being placed between to raise it slightly. To the other end of the spring (which, in this case, is about three feet long by four inches wide, and one-fourth of an inch thick) is attached a chuck for holding the die, or other article to be planed.

The chuck has a *V*-shaped projection on the bottom, and set screws on the side.

Between the chuck and the table is a cast iron plate with a steel cam dove-tailed into it. The cam may be concave or convex, but must be the reverse of the shape wanted on the die. This plate is not fastened to the table, but to the rod that extends to the end of the planer, where it is bolted to a post that is attached to the girt of the bed-piece. It will be seen that this cam-plate must be stationary, but it allows the chuck to slide above and the table to slide below it.

The effect of the cam is to throw the chuck containing the die up against the tool when the *V*-shaped projection slides over it.

In the sketch, *C* represents the table of a planer sliding on the bed *A*. To the table is bolted one end of the spring *D*, the other end having the chuck *E*, secured to it. On the under side of the chuck will be observed the projection *G*. As this projection slides over the cam, *L*, contained in block *H*, the chuck with the die, *F* is thrown up against the tool.

There is no difficulty in planing an arc four inches long, on a circle ten inches in diameter.

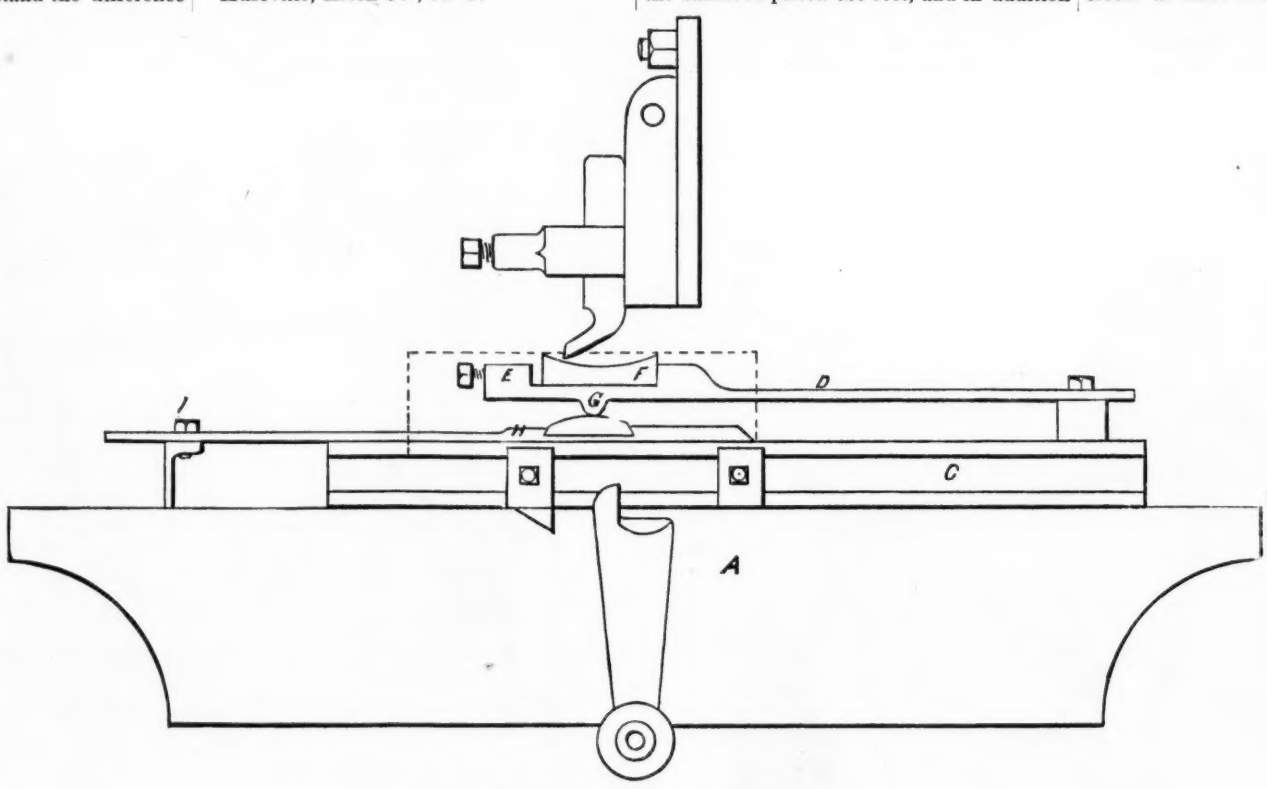
The dotted line is a small angle plate back of the chuck to take the side thrust off the tool. A sheet of tin is placed on the table under the block *H*, to prevent wear.

The rod *D*, which holds the block *H*, is shotted to permit slight adjustments, as the tool needs grinding.

I have planed a great many dies with this arrangement, and find it works perfectly.

Other forms may be had by changing the cam *L*.

GEO. W. THOMPSON.
Huseville, Essex Co., N. Y.



DEVICE FOR PLANING DIES.

VOLUME AND PRESSURE OF STEAM.

Editor American Machinist:

Owing to my own fallibility, and consequent dependence upon the few really good authorities in engineering matters, I feel constrained to resist, as far as possible, the attacks made upon them of late by some of your correspondents who seem to enjoy demolishing such men as Prof. Rankine and John W. Nystrom.

Although Rankine is about the best authority known, and Nystrom among the best, they have both been ruthlessly done for, and we are compelled to lift up our voices before the few remaining are squelched, and the engineering fraternity left without chart or compass, so to speak.

Dropping sarcasm, the facts are about as follows:

Whilst such communications do no harm among competent engineers, more than the waste of time in reading them, they are apt to mislead and confuse young students, of whom great numbers look to your paper for information, and who will have the trouble sometime of unlearning much they have learned wrong, before they will be capable of discriminating between facts and fallacy for themselves.

In Mr. Golding's criticism of Nystrom, we are told that the volume of steam at atmospheric pressure is 1728 times that of water. In fact it is only 1641 times the volume of the water required to make it. Then we are told that at that pressure it will do no more work after it has overcome the resistance of the atmosphere for a distance of 1728 feet, whereas it would continue to raise a gradually lessening load a much greater distance. And where he pronounces the steam *used up* in the second case at half stroke, it is still capable of raising the original weight the remaining 864 feet, after having developed the same amount of energy as in the first case, showing, to use his own figures, a gain of 1,866,240 foot pounds: in reality, the gain is much greater.

We also find the statement that, with a four-fold load, a pressure of two atmospheres will be obtained, which will surprise many.

In fact, the case is about as follows;

A cubic foot of water transformed into steam, in a tube of 144 square inches area, would raise a balanced frictionless piston against the pressure of the atmosphere 1,640 feet, and develop $144 \times 14.7 \times 1640 = 3,471,552$ ft. lbs. The same amount evaporated at a pressure of two atmospheres, would raise double the weight 820 feet, and develop $144 \times 2.94 \times 820 = 3,471,552$ foot pounds the same as before; but, by continually lessening the load until the pressure is reduced to that of the atmosphere, we find it will have raised the balanced piston 820 feet, and in addition it has raised in the last 820 feet the varying load which we have been removing from time to time.

All told, the steam commencing at half-stroke and two atmospheres will still develop in round numbers 2,361,000 foot lbs., which is entirely due to the extra energy in the higher steam. With a four-fold load the pressure will be four atmospheres, and the 3,471,552 ft. lbs. will be developed in 410 feet, leaving 1,230 feet in which to expand to atmospheric pressure, at which pressure it will have developed 4,723,000 additional ft. lbs.

At higher pressures the increase of energy is still more noticeable.

Moral. Study the authorities well before you demolish them.

F. B. RICE.
Dunkirk, N. Y.

Editor American Machinist.

I lately saw a 28-inch swing lathe, with compound gears, built by the New York Steam Engine Co. The workman running it said that he used no reversing belt in cutting screws, but had a mark on the edge of the face-plate, and by measuring stopped it each time at the same place, after which he loosens the carriage nut from the lead-screw, then runs the carriage back to a certain mark on the shears. The nut is then thrown into gear with the lead-screw and then go ahead. The lead-screw is three threads to the inch. This may be of service to many if you are pleased to print it, and may be the means of bringing out other and better ways.

Yours respectfully, L. O. CHAPIN.
Sedalia, Mo.

Minneapolis is a great milling city, no doubt; a wonderful milling city, whose millers are chock-full of enterprise and ideas, and who are more progressive in their notions than those of any other milling center. But they don't get their ideas by inspiration, and are not exactly infallible. At least they have not been in the past. Several years ago they put in rolls for crushing wheat, and then took them all out again. Now they are put-them in again.

A similar thing has occurred at Budapest, the other great milling center of the world. Some time ago the millers of that good town ignominiously kicked out all their millstones. They had no use for them. The roll was the thing. Now they have been putting the millstones back, and using both rolls and millstones, with better results than they ever got before with either singly. It must be flattering to other millers to know that even their big neighbors in Minneapolis and Budapest discover, or at least think they discover, errors in their former practice. We know of one big miller in Budapest, who said a year and a half ago that he would never use a millstone again for any purpose, except for ending the wheat, but he is now using quite a number of them along with his rolls. The lesson certainly is that we cannot afford to be dogmatic, or too pronounced about this or that machine, or this or that system. The proof of the pudding is the eating thereof, and it is better to eat the pudding than to have to eat our own words at some future time. No one knows so much about milling that he cannot learn something, and the sooner our millers, even the best of them, acknowledge their position as learners as well as teachers, the more rapid our progress in milling will be.—*American Miller.*

Coal-Dust Burning Locomotives.

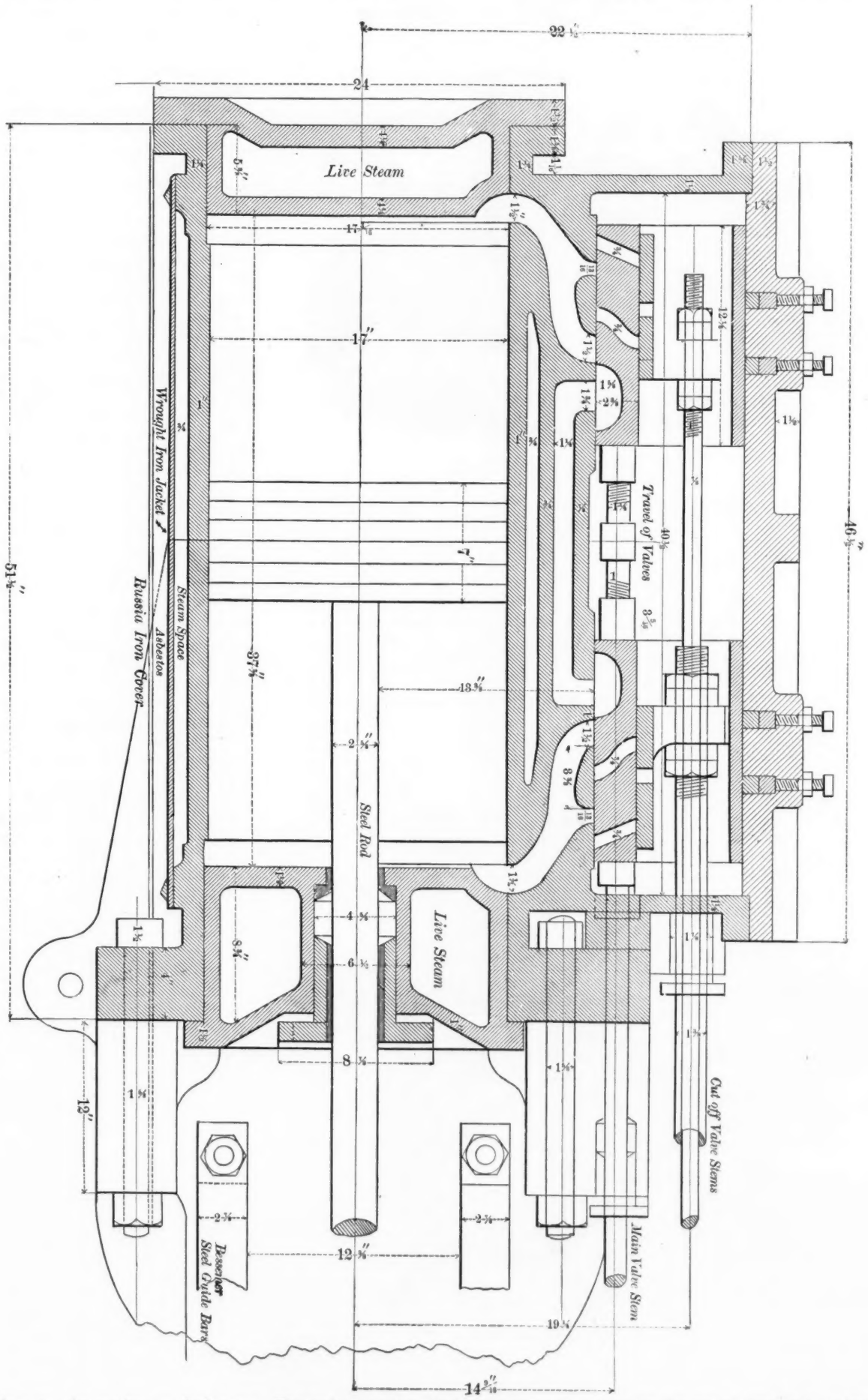
A peculiar looking locomotive is attracting attention on the Reading Railroad. The cabin is perched away up on top of the boiler like a saddle on a long-bodied horse. Its oddity causes much comment by passengers and citizens along the route. This locomotive is one of the three coal-dust consuming engines in use on the road, the other two being run on the Bound Brook division, and on the Germantown route respectively. It has four driving wheels, each five feet seven inches in diameter, and four track wheels, each thirty inches in diameter. The fire-box is eight feet long by four and a-quarter feet wide. The engine is capable of a speed of seventy-five miles an hour, and the peculiarity of construction is rendered necessary because it consumes coal-dust instead of coal. This is a great saving in the item of fuel, and the company is adapting the patent, which is the idea of Superintendent Wootten, to all its engines as fast as possible.

At Copenhagen a new type-writer is produced without the usual key-board. Semi-circular cups, which are placed directly over the circle of type-arms, do the work, and when pressed by the finger, directly effect the imprint.

Coachmen should be successful poker players. They generally hold a pair and sometimes four of a kind.

Working Drawing of a Steam Engine.—Description of Cylinder, Jacket and Valves.

The cylinder is completely jacketed with live steam taken direct from the boiler through a 1¼" pipe. The jacket casing is of boiler plate $\frac{5}{16}$" thick, riveted on to the cylinder, leaving a steam space of ¾ inch all the way around the cylinder. The surfaces on cylinder and jacket are perfectly smooth, thus offering no obstruction to drainage. *No water can lodge in this jacket.*



The cylinder heads also act as jackets, live steam being admitted to each, and each is drained at the bottom.

All water from condensation is trapped into a small tank, and is from thence forced by a small pump, working continuously with the engine, into the boiler.

The main steam valves are connected by a right and left screw for perfect adjustment. They are balanced up to two-thirds of the chest pressure, by rings fitted to the chest bonnet, the lower rings being made of cast iron, while the upper ones are a series of thin plate rings, each $\frac{3}{32}$ inch thick, convexed and concaved faces, placed together for elasticity. The rings are brought to the proper bearing by four set screws. The space inside the ring forming the balancing surface is $\frac{1}{16}$ inch deep, and is connected to the upper end of the small double-acting drain pump, which maintains a vacuum under the rings, and by which any leakage can be detected at once.

The main valve is worked by an eccentric, which transmits its motion to the valve stem by a peculiar lever and wrist-plate combination, giving a very rapid movement to main valve at the point of opening and past the half stroke, when it begins to reduce its speed, and at full port pauses and moves toward the close very gradually, until the half travel is passed again, when it closes, as it opened, with great rapidity. By this means a port of twenty square inches (which is the size at the cylinder bore) is just as efficient as 26 square inches would be with a simple eccentric motion. The ports are each $\frac{13}{16}$ inch wide in each valve, outside lap $\frac{5}{8}$ inch, inside $\frac{3}{32}$ inch. Travel of valve $3\frac{5}{16}$ inches.

The cut-off valves are also worked by an eccentric and wrist-plate motion. The travel of these valves can be changed at will, but for usual work they will travel four inches. They are operated direct by a centrifugal governor fixed on the main crank shaft. By the lever and wrist-plate combination, used in this case, the cut-off valves have a rapid close by the cut-off eccentric, independent of the extra hastening of the closing by the governor. Both valves can be worked by hand lever (the main and cut-off), and the cut-off valves can be adjusted on the seat of the main valve to any desired point, by a simple device entirely outside of the chest.

There are plenty of individuals, says Josh Billings, who can't make a boy's windmill that will grind, to save their lives, who wouldn't hesitate a minute to tell you how to improve a steam engine.

The Washington Monument.

The joint committee on the completion of the Washington monument lately submitted a report to the House of Representatives, showing that $67,903.90 have been expended in the work of strengthening the foundations, leaving available $32,096.10 of the appropriation for that purpose, and that $31,356.45 has been expended for the completion of the monument, leaving $68,643.55 available of the appropriation for that purpose. The total amount unexpended of the appropriation and now available for carrying on the work is $100,739.65. This amount will be sufficient to complete the strengthening of the foundation, providing the iron framework of the interior stairway for 250 feet, to construct the shaft, and add twelve feet to the height of the monument. To continue work until October 31, 1881, will require $300,000 additional, and to complete the shaft to the proposed height, 500 feet, will require $677,321. It is estimated that the entire work can be accomplished by the spring of 1883.

Four of the largest trade unions in Great Britain have, during a comparatively brief term of existence, spent upwards of $1,300,000 in relieving the wants of members on strike.

Advance in Wages.

The wages of the employees of Mace & Weeks, shoe manufacturers, Philadelphia, have been advanced 10 to 15 per cent. to date from the first of January next. This was done voluntarily by the house.

All the furnaces of the Crane Iron Co., Lehigh, Pa., are in blast, and the men have obtained a ten per cent. advance in wages.

Two hundred journeyman horseshoers struck, December 15, for higher wages in Chicago, which in most cases were granted, and they returned to work at an advance of 57 cents per day.

The wages of bottomers in E. P. Dodge's Newburyport, Mass., shoe factory have been increased 15 per cent., the first advance in five years.

The wages of the Williamstown Manufacturing Company's operatives, North Adams, Mass., have been advanced ten per cent.

The wages of the operatives in Faulkner's mills, Lowell, have been advanced ten per cent.

P. Waldmeyer & Co., Woburn, Mass., have increased the pay of all their workmen.

The Pottsville, Pa., Iron Company have added forty cents a ton to their puddlers' wages.

The wages of the employees of the Cambria Iron Works, Johnstown, Pa., were advanced about ten per cent. on the 1st of December. They employ about 4,000 men.

The Quinebaug, Taftville, Wauregan, and Williamsville Cotton Mills, Conn., have posted notices of an increase in wages, taking effect Jan. 1, 1880.

The employees in the manufactory of the Ventilating Waterproof Boot and Shoe Company, Lynn, Mass., have had their wages advanced ten per cent.

Steel in Shipbuilding.

In regard to the substitution of steel for iron in steam ship building, Mr. John Burns, one of the members of the Cunard Steamship Company, speaks of the recent contract with a large builder, remarking that "we have adopted steel for the hull and boilers of the Sahara, but under a provision so stringent that every plate, before acceptance, will undergo a severe and rigid test by a qualified surveyor appointed, and stationed at the steel manufactory for that special purpose, and that the manipulation of the steel by the builders shall be subject to an equally careful supervision by qualified engineers of our own appointment. The steel is to be made on the Siemens-Martin process, and all rivets, as well as plates, throughout the ship are to be of steel."

Wall Paper Printing Machines.

In England and France colored figures were first placed upon wall papers by means of patterns. The product was good, but the process expensive. For many years ornamental wall papers (or tapets) were too costly for common use, but as soon as machinery for printing the figures came into use, the price underwent a great reduction, and the consumption a corresponding increase. This industry is now a rapidly growing one. The first machines for printing wall paper were built in England. In a few years France and Germany also undertook to build machines for this purpose. The cuts on pages 4 and 5 of this issue represent a superior class of machines for printing wall papers, exhibited by Tulpin Freres, Rouen, France, at the last Paris Exposition. As the colors used in wall paper manufacture are either mineral or fluid (inks), in order to insure durableness, they are put upon the paper mixed, the former with glue and the latter with dissolved alum. A machine serving only to glue the paper is shown in Fig. 1. Upon the roller shown in the foreground the paper is rolled up. When the machine is in operation, the paper leaves the roll in the direction of the arrow, after taking up the glue. Upon the frame of the machine may be observed two reservoirs (or boxes) from which the fluid mixture is conveyed through the axle of the cylinder, over which the paper is moving, and distributed uniformly over the sheet. The mixture is thrown from the inside of the cylinder through small holes upon the paper.

The ground-work machine is shown in Fig. 2. The work performed by this machine was formerly done by a workman placing two broad stripes of color upon the paper with a brush, and two boys following and spreading this color over the whole surface by rubbing. This whole operation is performed by the machine, shown herewith, as the paper is rolling off the back cylinder over a cast iron form or guide, and then is pressed by a rubber covered cylinder against two smooth color rollers. The lower of these two rollers, being brass, runs, as the cut shows, into the copper color reservoir, the upper roller spreading the color upon the paper, while a long brush prevents it being spread too thick by the four round brushes. These brushes are actuated by a gear wheel, and are so arranged as to permit of working each brush separately. This adjustment is effected by means of a lever on a toothed segment and a thumb latch operated by a spring, enabling the color brushes to be lifted or lowered. Through a crooked handle is a kind of drag with double springs located on the front part of the machine, which is used to bend the paper or to stop the machine.

The patterns for the machine are engraved upon cylinders, and the paper runs gradually through, under all the cylinders, to receive each of the colors. The printing machine is shown in Fig. 3, page 5, it having, as will be observed, many points of similarity to a cotton printing machine, the idea of its construction being taken from the latter. For printing with eight colors, eight cylinder systems are used. The paper is placed upon the upper arched arm upon the four cornered roller. A circular apparatus serves for smoothing out the paper and making it tense. It next moves to the large drum. The latter is covered with cloth, and takes up the print of the design cylinders upon which are engraved the pattern. By means of an endless cloth being conducted through the cylinders, the color is put upon the design cylinder and printed upon the paper, which, as it goes over the drum, comes in contact with all the cylinders.

The whole arrangement of the machine is commendable. The frame is very solid and will not shake at high speed. The capacity is about 3,000 rolls a day. It is provided with a counter to show the number of revolutions of the designs. The paper, after passing the last cylinder is taken to a drying apparatus. Through the manifold contact with water the paper becomes rough and plain-looking, and must be smoothed and satined. The smoothing is done by a calender roller, as used for textile printing, while for satin finishing the machine represented in Fig. 4 is used. This is an entirely original machine, those previously described being built up more or less upon foundations already existing. In the cut may be seen a large gear wheel moving a drum. Motion is communicated to this large wheel by a system of gears. By means of this large wheel are driven with rapidity a number of roller brushes, not only with a rotative, but also with a lateral motion imitating as closely as possible hand work. The distribution of tallow is effected automatically by a roller covered with sheepskin, rubbing itself on the paper upon which the tallow powder is clearing. After this, the satined wall paper is drawn out from the machine and rolled up.

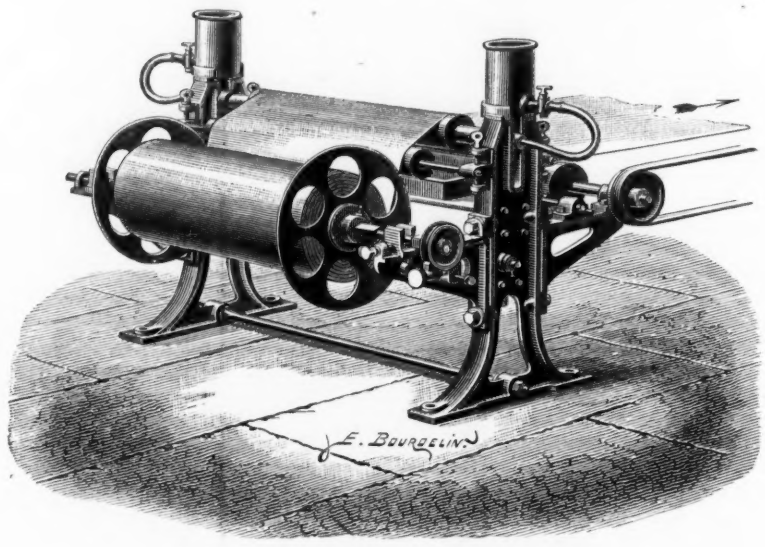


FIG. 1.—WALL PAPER GLUEING MACHINE.

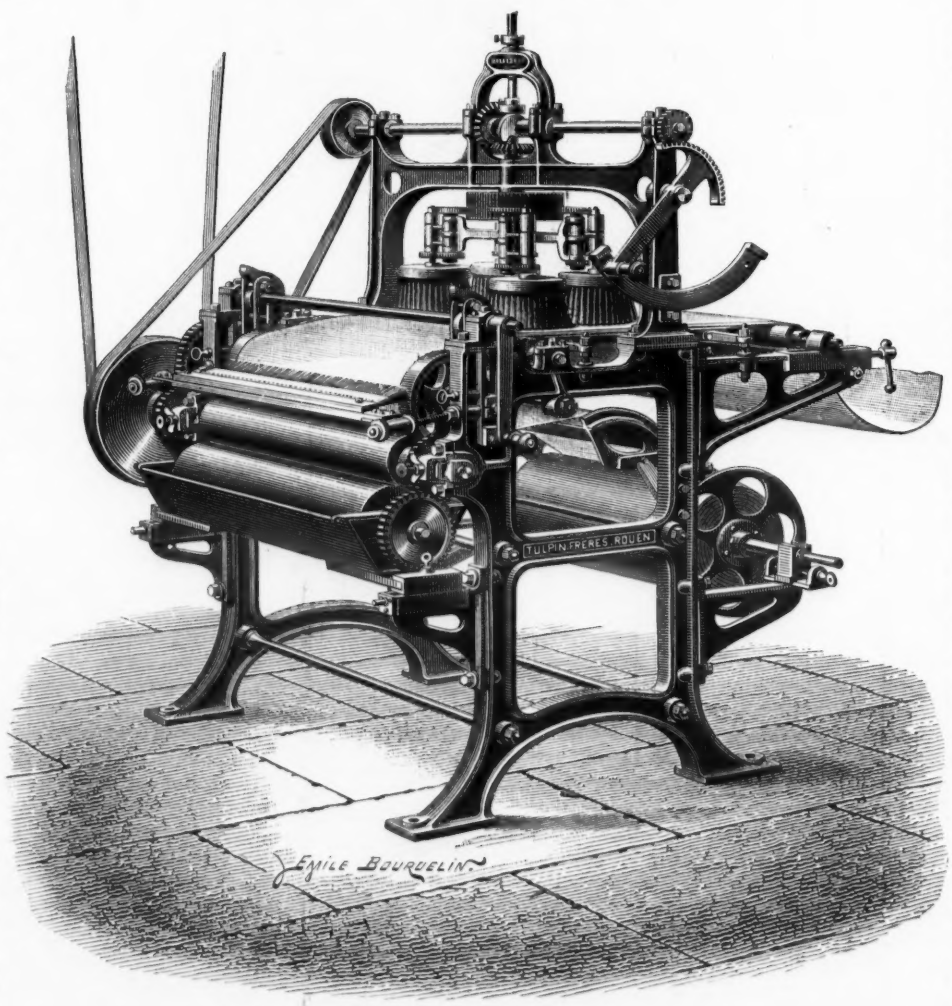


FIG. 2.—WALL PAPER GROUND WORK MACHINERY.

A New Rock Borer.

It is said that there is now manufactured and in use in Germany a rock borer, intended to take the place of the diamond drill, which does not cost one-fourth as much as the latter, and is said to be a great deal more efficient.

Address to Student Engineers.

The following pithy and instructive address was read by CHARLES E. EMERY, Ph. D., before the last graduating class of the Stevens Institute of Technology. We advise its careful perusal and preservation by every young engineer whether a graduate or not. Part of the address is published in this issue, and the remainder will appear next week.

HOW TO SUCCEED.

MR. PRESIDENT: Through you, and in the presence of your associates and of the ladies and gentlemen present, I have the pleasure, as requested, to address myself to the members of the graduating class.

GENTLEMEN: After enjoying for four years the unusual facilities afforded by this excellent institution, you are about to receive diplomas from its officers showing that you have creditably completed a course of study which entitles you to the designation of *mechanical engineers.*

The anxieties, exertions and fatigues of the past are forgotten in the triumph of the present, and the buoyant feelings due to the reward of past industry illuminate the future, presaging new triumphs and worthy achievements.

At the outset, I would, as a comparative stranger, with some experience of the outside world, endeavor to firmly impress upon you what I feel assured you have in substance heard many times from your instructors, that at graduation you by no means complete your education. You simply cease to be called students, and begin to be called engineers. To some of you, undoubtedly, this long looked for period signifies a release from restraint, and the tasks of the future are expected to be lighter, because self-directed, or initiated and limited by voluntary choice. This, however, will not prove to be the case. Life ever has its burdens and its lessons. Independent action requires increased exertion and increased responsibility. In professional life it is ever necessary to continue study of one kind or another. Investigations of the experience of others are frequently required to enable conclusions to be drawn applicable to new problems, and often the general information given in standard works must be traced back to its original sources, so that the details will instruct in making new investigations on the same general subject.

In entering upon the practice of your profession, you will at first, for most undertakings, feel greatly the want of practical experience; and if circumstances enable you to obtain it hastily, you will generally find it bitter or expensive.

In this institution you have had unusual opportunities to acquire practical information, but the time occupied by the course is so limited, when considered in relation to the field to be covered, that it is impossible here to more than point out the principles by which you are to be governed, with such practical illustrations as will fix the same in the mind; and, in connection therewith, to thoroughly familiarize you with a carefully considered system, which has been brought to a high state of perfection by the continued efforts of learned men for a long series of years,—by means of which you may identify what others have examined, described and classified; readily perform operations by methods already developed in detail; apply old principles to new forms to meet new requirements, and in time be able to record your own developments and conclusions in a technical language that will be understood and accepted by others.

From the little practice it has been possible for you to obtain in connection with other important instruction, it is impossible for you, unaided, to know how much you lack; but I trust that your superior advantages here, and the many words of warning received, may keep you from the experience of so many in other places, who have graduated with such an overweening estimate of their own attainments and abilities as to actually unfit them for the practical duties of life.

As the great secret of success is to start right, I have thought it my duty to point out clearly the errors into which others have fallen, and then to suggest methods by which such errors may be avoided.

The want of practical information among the graduates of many institutions has been so sorely felt by engineers, that the nature of technical education, but more particularly the order in which principles and practice should be taught, have been much discussed by able minds. Some have held that, after some preliminary studies of English branches in childhood, the lads should be put at work with the expectation that, while acquiring practical knowledge, they would appreciate their lack of general information, and, at a later period of life, find the higher courses of study attractive; as the students would then intuitively apply the principles to their former experiences, and see the advantages to be attained in understanding more difficult problems, and thus the necessity of much of the earnest exertion necessary to keep students up to their work be avoided, and, perhaps, some time saved eventually in accomplishing a certain stage of instruction and experience. It is not necessary to go into details. This and the usual course have each their advantanges, and, of course, their advocates; while, perhaps, many on both sides would agree that if it were possible to

double the length of the course and have the school in a large manufactory, principles and practice could be systematically combined, so that the students would be fairly efficient in both. I have become firmly impressed that the usual order, or that in which you are receiving your education, is by far the best. Impressions gained in youth are ineffaceable. If there were no other reasons, it is sufficient to say that the early years of a young man's life should be spent, when possible, among gentlemen, and in a circle of the highest culture and refinement, so that the manner and bearing of the inchoate man may become so firmly fixed, that the rough, external contacts of practical life cannot change its course. Yes, thank your parents or guardians and their advisers, that you have commenced thus, and not been obliged to endure, first the associations and discomforts of practical life, and then afterward, when you come to realize how much that is desirable is to be learned, find, as you are fitting yourself by laborious study for a higher sphere, that you must at the same time, exercise the utmost self-control to keep your manners and habits consonant with your surroundings. Again warning you, however, that you have yet to obtain practical experience, I may add, that you gain many other advantages in completing so thorough an understanding of the principles of your profession at this time in life. Had you first started with practical work, you might have become so occupied therewith as to omit study entirely thereafter, or circumstances prevent its renewal. Men of ability may begin by performing the actual manual operations required in construction, and though possessing only the rudiments of the system in which you have been so thoroughly instructed, by the simple exercise of the powers of observation and good judgment, may, in connection with actual participation in the work, be able to design and make apparatus well adapted to the particular services required, and by noting the experiences of others, adapt the same to different locations, and even make decided improvements. But, nine cases in ten, their efforts must be confined in that particular channel, and they cannot rise to its higher requirements, much less change greatly the line of labor they have learned, without going over, in a rambling, unsatisfactory manner, a few of the principles you know so thoroughly; and they cannot even acquire them without a sacrifice of time, which, late in life, is truly appalling. You, on the contrary, after you have obtained some necessary practical experience, are fitted to begin and enter creditably into any branch of your profession, and, by patience and application, may secure a position in life and society both honorable and remunerative.

Immediately following these words of encouragement, I would refer again to the necessity for practical experience. At the present moment, in a struggle for precedence with one who had learned to do one thing well by practical participation and experience, you would labor at a decided disadvantage. It is not simply that such a person has the mechanical skill necessary to actually execute the work with his own hands, but supposing that the work is to be done for both by others, he knows better how to make the designs, so that the workmen can execute them in the simplest, quickest and cheapest manner. He knows what is possible, and cannot be imposed upon by the workman, the contractor, or the dealer in supplies. You have little idea how potent these advantages are. I mention the subject to assist you in determining what your next course must be. Evidently you must begin to acquire practical experience as you begin to be called engineers; and once realizing this, the task is comparatively simple, that is, it may be accomplished by patient perseverance, but in most cases without at first being able to use anything which you have so far learned which *you* consider of importance. It is well known, however, that young men from school learn practice far more rapidly than those whose minds have had no previous preparation. Principles are intuitively applied to every mechanical operation, and the differences of treatment required for different materials traced to differences in the physical properties, so that by analogy other phenomena are expected to be proved true, which, if the reasoning be accurate, will be found to be the case; and thus the mind and eye are duly exercised together, making the study one of interest and often a positive charm. The great difficulty is to get young men started right, and prevent them from wasting their time waiting for something to turn up. Desirable positions are not to be had for the asking, but the time of waiting may be well occupied in watching mechanical operations closely and in detail, and in mentally studying out the reasons for every step. If this be done persistently and thoroughly, the difficulties incident to the early periods of actual participation will be much lessened. Frequently the conceit of young men prevents their getting a pleasant start in practical life. They have no idea of setting to work quietly in the methods with which they find themselves surrounded until they are established in place, but permit themselves to offer alternately such floods of questions and suggestions, that it becomes necessary for others to interest themselves in their behalf. I would gladly drop this unwelcome subject, particularly here in the presence of your parents, your sisters and your friend's sisters, and take it for granted that no mechanical engineer will make such mistakes, but that they will be confined to others—civil engineers, for instance. But as you will require to have frequent intercourse with these gentlemen, an incident or two will enable you to give them some valuable information.

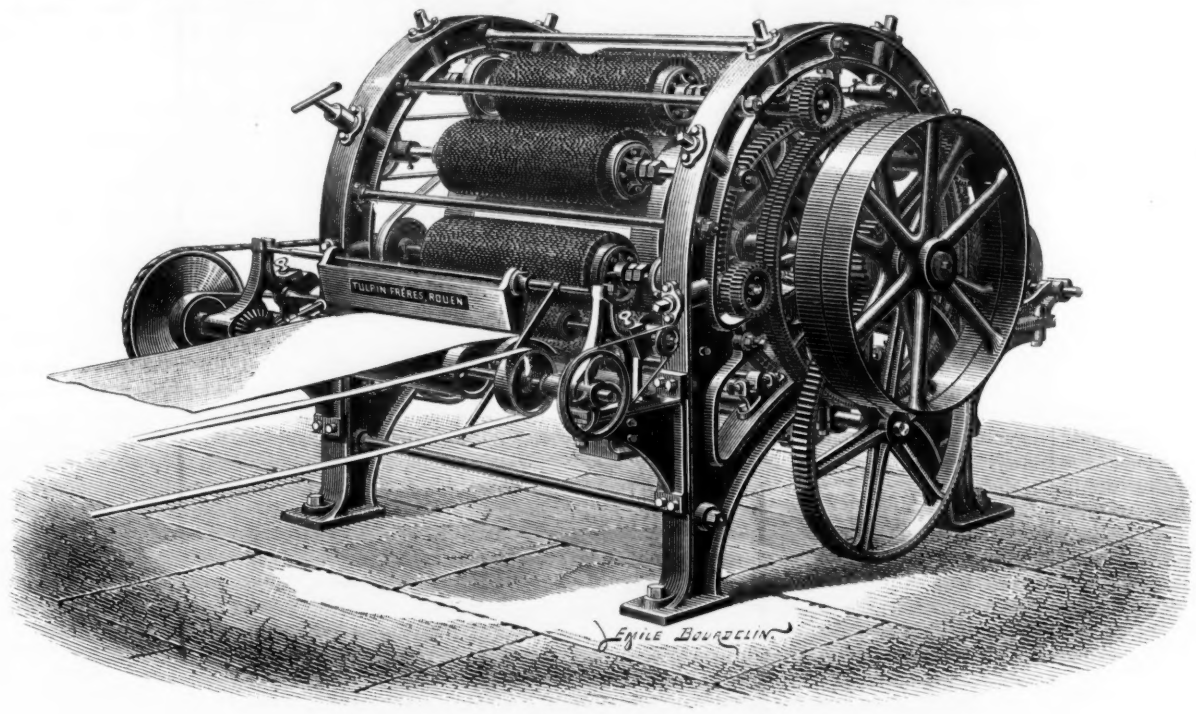


FIG. 4.—WALL PAPER SATIN-FINISHING MACHINE.

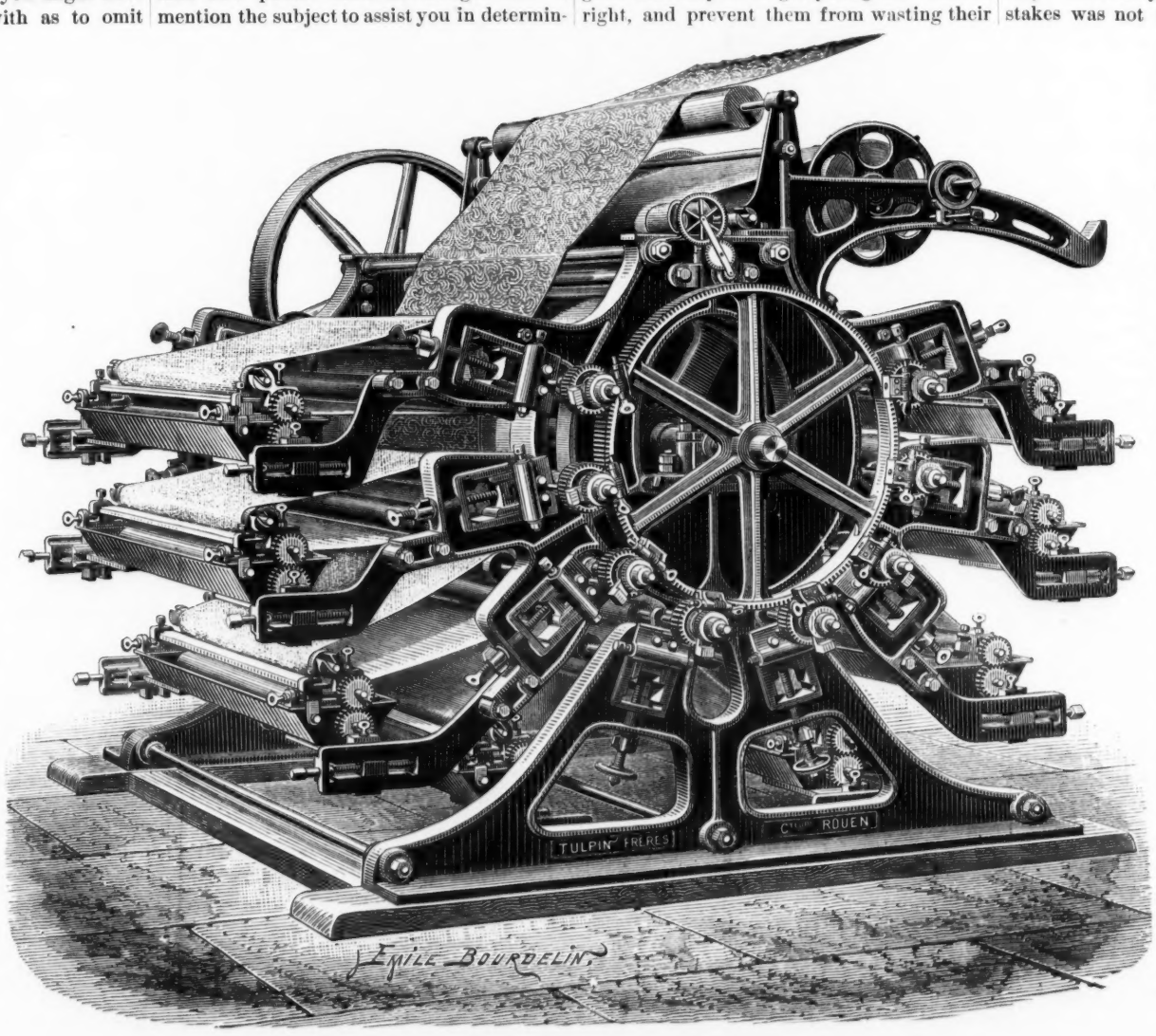


FIG. 3.—WALL PAPER PRINTING MACHINE.

Our first scene will be located on the line of a proposed railway, in process of construction. After inspecting the work for a time, we remark to the engineer in charge: "That seems to be a capable young man you have with you; where did you find him?" "Oh, X sent him to me from Y-town college. He was a tearer, I tell you. Had to keep him up in the shed yonder with an axeman, for two days, learning how to make center stakes. He's done pretty well since then." No further explanation will be necessary. Evidently, the way to make center stakes was not the only thing that young man learned. We can guess that he probably wished he had not, in the first place, offered to instruct the whole party how to make such stakes. Frequently, experiences are not as pleasant as this, and cannot be related. Do not think, however, for an instant that there is any feeling of school and anti-school in the matter. Those that have had their own experience, only know better how to make their instruction effective. In one case an "oldster" asked a "youngster"—"How are we going to get that engine off that car?" A derrick was suggested; but, not being available, the young man received instructions to make drawings for one that would answer the purpose, with the suggestion that the rigger knew of a few poles, and had some ropes and spun yarn that might be considered, in making the design. The young man diligently proceeded with his drawing, and blocked out a very *creditable, permanent* apparatus, embodying, however, sufficient iron work and wooden framing to occupy the mechanical force of the station for several days. His superior approached, examined the well-progressed work on the drawing board, and merely said, "Well, let us go out and see the engine taken down." Our young friend followed wonderingly, and, as the pair approached, lo! the horrid rigger had arranged his poles on either side of the car, lashed the tops together, and from the shears thus formed, the engine was *already* sup-

ported free of the car; and, while they looked, the latter was rolled away, the engine lowered upon improvised slides and moved off out of the way, and into the position assigned. Many a young man could have seen that operation performed a hundred times, and it would not have made the impression on his mind that it did on that of our industrious young friend, *after* he had so nearly completed his drawing.

A well known gentleman, connected with the government service, takes a different tack. After waiting a reasonable time for his ideas to be put in the shape desired by the new comer, he may commence as follows: "*You know, my distinguished young friend, that I would not ask you to perform this service if I could possibly do it myself. I must entreat you, therefore, to take this into consideration, and permit me to have some small portion of the work in accordance with my own views.*" I see the response in the eyes of each one of you—"I will *never* have to be spoken to in that way." Of course not. The young gentlemen referred to were a different kind of engineers, came from a different school. But do I hear you say, "In those schools they do not have the advantages we have had." I would just like to tell that gentleman how they do at the Stev——! Hold! One moment, please? You see the point, and are now prepared to hear suggestions.

I would here say, however, that I do not wish to belittle the opportunities you have had for obtaining practical experience. This institution excels in continually introducing practice to illustrate principles, though not neglecting the latter, during what is really the preliminary stage of an engineer's education, and has furnished you with unusual facilities in its laboratories and workshops; in the external contact with practical life in the Testing Department, and in the contiguity of large manufacturing establishments. The other "party" to which we were introduced, in the opening address of the President—the dynamometer exhibited on this platform—which was made entirely by members of this class, drawings, patterns and workmanship (I was about to say materials, but I credit the known sagacity of the trustees sufficiently to warrant that they did not permit the erection of opposition blast and puddling furnaces in the basement, when the iron market is so flat); the dynamometer, I say, is truly very creditable in design and workmanship, and shows that you have already had considerable experience in mechanical operations. I only wish to impress upon you that, from necessity, there is yet very, very much to be learned, though you are now in a position to make yourselves really quite useful, if you set about it in the right way.

In the first place, it will be well to remember that from the time you first commence duty in an engineer's office, or in a manufacturing establishment, until you cease connection therewith, you become part of the working force or machinery of that establishment, by means of which its operations are carried on for the service of the public. Your best services are expected, and nothing should be allowed to interfere therewith. A suggestion in respect to moments of leisure will be made hereafter. At first you are not expected to make improvements, or even suggestions, but to conform in all that you do to the previous usages of the establishment. The better you accomplish this the sooner you will become useful, and, after a little experience, your talents will find a level without attempts to force them forward.

Excuse me if I go into details, for I feel assured you will find them of service. You have received here very thorough instruction in drawing from approved models: but if it be your lot to begin practice in the drawing room of any establishment, your true policy is to adhere closely to the practice of such establishment. If instructed to represent a particular thing, the best way is to obtain a drawing of a similar device, and copy it with the simple change ordered. You will find that this is the ordinary practice, and that other changes will not be permitted. If no drawing is available, it is best to take sketches from devices of the same character, and be careful to follow them closely, unless otherwise directed. The work should be done promptly, and in a style equal to that shown by the drawings of the establishment, but should not be so much better as to require unnecessary time. You thus make yourself useful, and establish your position, It will be of advantage to you at first to make tracings of the drawings of others, simply to become familiar with the details used in that particular establishment. If novelties are to be carried out, be sure to understand the views of your superior; then, without unnecessary questions, represent the object on paper as quickly as possible, so as to have something to be criticised and corrected. Incomplete or indefinite sketches, which do not show whether a certain arrangement is practicable or not, will not be satisfactory. Always alter your plans, as requested, with the best of good nature. When you feel that you have established yourself, and make suggestions to test the application of your principles, patiently see such suggestions rejected. Your principles will probably be right, but practical difficulties do not permit them to be carried out in the way you propose.

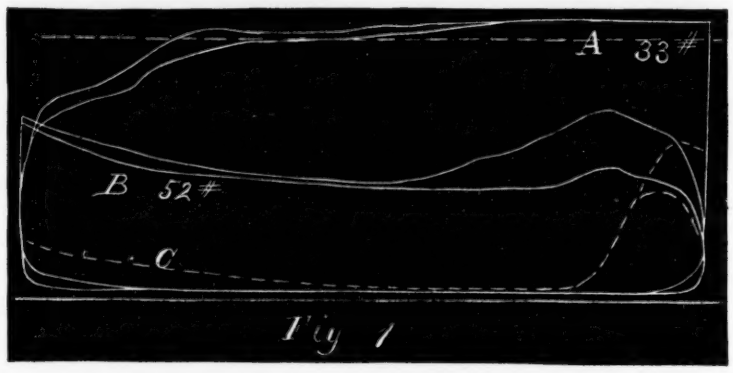


Fig 1

Boiler Proportion and Construction—Fixing the Number of Tubes.

BY WM. H. HOFFMAN.

In one of the first articles on this subject I stated that most of the boilers now in operation have too many tubes for the best economy.

This conclusion was reached by actual experiment. Of fifteen boilers experimented on, all using well proportioned heaters, and above the average steaming coal, only two gave an evaporation of nine pounds of water per pound of fuel, and only *one* $9\frac{4}{10}$ths pounds. Four touched $8\frac{1}{2}$ pounds, two $8\frac{1}{8}$, and the remaining six ranged from 8 down to $7\frac{8}{10}$, which was the lowest.

The highest evaporation was reached with a 66″ boiler, containing sixty-six $3\frac{1}{2}$″ tubes, fourteen feet long; eight of the lower courses of tubes, and *four* of the side courses being purposely closed at each end. Before the change was made, this boiler gave an evaporation of $8\frac{9}{10}$ pounds to one of the fuel, and after the change the evaporation was $9\frac{4}{10}$ pounds.

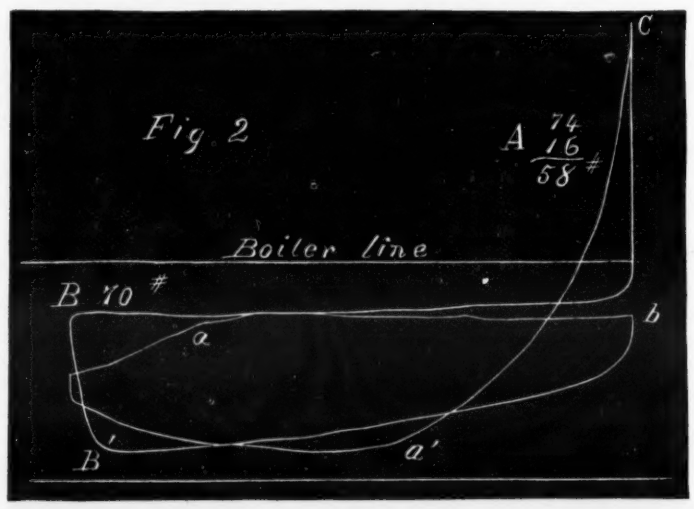
Before the change the tube area was $\frac{33}{100}$ of the grate surface, and after the change $\frac{17}{100}$ was the area compared with grate.

The heating surface before the change was 39 to one, compared with grate, and after the change, $35\frac{1}{4}$ to one. The temperature at the flue leading to chimney (chimney 120 feet high) before the change was 462°; by the change this was raised to 540°, and the damper was shifted from three-fourths open to half closed. The velocity of the hot air was, before the change, about 122 feet; after the change, this was increased to 136 feet per second. This goes to show, that, before the change, there was too much tube area for the grate (although the grate surface was a little too small). The extra amount of tube surface offering too much resistance, by friction caused the currents of hot air to be sluggish, and, of course, the temperature fell below the economical point, and the heat did not impinge on the sides of the tubes with a sufficient degree of intensity. I think it is generally conceded that the gases cannot leave the boiler at a point below 520°, without impairing the draught power of the chimney.

In the case under notice, this power measured in inches of water 1.112; this was after the number of tubes had been reduced. The cold air entered at about 70°.

Therefore, I believe that the tube area should be about $\frac{1}{4}$ of the grate area, and subdivided as little as possible, consistent with good circulation, and making *no* tube more than 48 diameters long.

The boiler giving the lowest evaporation had a 42-inch shell, and contained seventy $2\frac{1}{2}$V tubes, *staggered* tubes being fourteen feet long. This boiler was primed continually, and none of the usual remedies seemed to affect it. The tubes were $\frac{3}{4}$ of an inch apart, and, under ordinary firing, a vibration of the tubes could be noticed, caused, of course, by the forced currents of water through cramped passages.



Other boilers with sixty-four $3\frac{1}{2}$ inch tubes 18 feet long, gave only an evaporation of $8\frac{1}{8}$ pounds; and of those with 3″ tubes, 16 feet long (60″ shell), 74 tubes gave 8 pounds, and one of the same size with tubes, staggered, or zig-zag, $7\frac{7}{10}$ pounds.

The fuel in all cases was hard coal of various brands, of quite uniform quality, *Buck Mountain Lehigh* being used in the cases of 60″ shell, 74 tubes, 16 feet long, and the 66″ shell, 54 tubes, 14 feet long. The number of tubes for a certain diameter of shell is, therefore, limited, for several reasons. Among these is the matter of grate area. A line representing a point equi-distant between $\frac{1}{3}$ and $\frac{1}{4}$ the total area of grate has proved to be the most efficient, as connected with the ordinary factory chimney. Then there is the matter of uniform and free circulation of the water in the boiler, and having too many tubes prevents the much desired result.

The gases must have a free, and, to a certain extent, rapid passage through the tubes, and must not flow at a velocity less than 132 feet per second, where they leave the boiler.

Then another item that has been overlooked, is the amount of water capacity at the points where the heat is the most intense.

Boilers with tubes too near the bottom and sides of shell *repel* the water, instead of converting it into steam, and in so doing, retard the circulation almost entirely at the surfaces, where most of the steam is, or should be generated; hence, the low evaporative power of this style.

Besides, the trouble with too many tubes, is the *great* trouble of cleaning; having poor circulation, the deposits collect with alarming rapidity, and in a short time the boiler is as good as ruined; and it cannot be reclaimed, as it is impossible to clean it.

There is just one remedy, and that is to remove some of the tubes.

* * * * In support of my theory regarding large tubes, and a limited number of them, I will call to the minds of engineers who practised twenty years ago, the stationary return drop flue boilers, used so extensively at that date in the Eastern States. A 66″ shell boiler would take the gases direct from the furnace through *four flues*, and return them to the front connection through *two flues*. Their average evaporation was 9 to 1; but they were expensive to build, and rather weak in construction at some points.

Talks—Dancing Governors.

BY WM. LEE CHURCH, C. E.

While I am talking about the subject of dancing governors I want to present a diagram (Fig. 1) which I have just come across. I took it, some years ago, from an engine of well-known make, and it exhibits one of the evils arising from "hunting," and which I barely alluded to in my last. It will be noticed that the back end, A of the cylinder shows a tip-top duty—in fact, extra good. The admission is prompt and full; steam line splendidly sustained up to the point of cut off by lap, which is well placed; the release would be hard to improve upon, and we can hardly afford to grumble at the $1\frac{1}{2}$ lbs. back pressure after such a grand performance. But the front or "crank" end B, (beg pardon of the Locomotive Brotherhood!) tells a different story. Not much "ladies' gaiter" about that card; more like what we used to see down at Manhattan Beach before Corbin got his back up—very, very splay in the instep, and a most comprehensive bunion! Yet you see just as good intentions in the valve motion on that end as the other, if the governor wouldn't meddle. The prompt admission, free release, and big ports are all there. I confess the reason why of such a sinful state of things bothered me quite a while. You will notice the pencil went over twice with pretty much the same results, and all the cards were similar. My first notion was to hunt for some sort of a leak, till I happened to notice the governor courtseying up and down with every stroke of the engine, as regular and pretty as you please. On the out stroke the governor let the steam severely alone, but on the in-stroke it came down on it most viciously, until just before release it let in a good charge, just in time to let it out again, and no good from it. You will remember we discussed, in my last, one reason why a hunting governor wasted steam, and our second point is now apparent. When a vibrating governor opens late in the stroke it wastes an amount of work proportional to the increase of pressure into the volume of the cylinder *up to that point*. The loss is analogous in character to that from excessive clearance, and to get a clear idea of it let us exaggerate the case as in the dotted card C. Here the steam is so severely throttled that at $\frac{7}{8}$ths of the stroke no apparent pressure remains, when the governor surges open and fills the *whole* cylinder with steam at 40 lbs. when

there is no motion, and hence no work left for it to effect. The point to emphasize is, that the steam wasted is measured by that volume of the cylinder *already traversed* by the piston, and not by that which remains to be traversed. Compute the water from the cards in question, and we find that A shows 33 lbs. and B 52 lbs., an average per full revolution of 42½ lbs., against say, 35 lbs., which would be fairly due to the load; over 20 per cent. loss.

It is profitable to note in passing how unsafe it is to rely upon a card from one end of the cylinder, under the supposition that the other is pretty much like it. Suppose I had only taken end A, I should probably have told my client that he was about as well off as he could expect to be with that class of engine. On the other hand, if I had guaranteed certain improvements based on B alone, I would probably have been pretty well flayed.

Though I have been talking about dancing governors, in this particular case the governor was more sinned against than sinning. It was of a well-known and standard make, in fact, one rather remarkable for steadiness in general. No amount of tinkering at adjustments or speeds seemed to be of any benefit, until I happened to notice that the engine always stopped at one point, and would even settle back to it if it happened to run by a little. There was the clue at once to a lop-sided fly-wheel sure enough, and a little time spent in balancing put a quietus on the whole trouble.

Here is just the place to moralize. There was a builder of high reputation, who conscientiously meant to do his work right. He put lots of good thought and better judgment into his cylinder and valve motion, and all the stock and labor in his engine were up to the same standard. Only he overlooked such a simple matter as the fly-wheel:—merely a wheel with a hole in it, you know. And the result was more coal wasted in the eight years the engine had been running than would have paid for it. It takes *all* the parts to make an engine.

I have shown you one card which was a sort of a curiosity in its way. I have got a fiendish desire to put in one more, Fig. 2. It will give somebody the nightmare sure. It did me, and so I propose to leave it for a week, merely hinting that it was an automatic engine, and a well known one. You can now worry over it, but I believe I would be reasonably safe if I offered a premium to the man who would show where the iniquity comes in.

The "Impermeable" Seaming Machine.

The machine shown in the illustration on this page is the invention of Milligan, Sayce & Co., of Newark, N. J., and was completed by them last fall after numerous experiments.

The term "Impermeable" is applied to the seam made by this machine, on account of its being an absolutely locked and air-tight joint impervious to air and water.

Its action is as follows: The operative takes the tin or iron from the former, and presses the edges against gauges situated on the horn or mandrel, these gauges being so arranged that the metal overlaps to the proper extent, and that as the machine is set in motion they will slide out of the way.

The operative now presses the foot on the lever communicating with the clutch, which is of a new style, and so arranged that the machine cannot make two revolutions successively, and thus make a double seam.

The upper movable die next descends and stamps the metal into the form shown in Fig. (1).

The upper die is double, so that after doing its work the inner portion recedes in order that another die, situated in the mandrel, and forming the anvil in the first movement may rise and force the metal up into the concavity made by the receding of the upper die—the extremities of the upper die being rounded—the metal cannot escape outside. This motion leaves the seam as shown in Fig. (2).

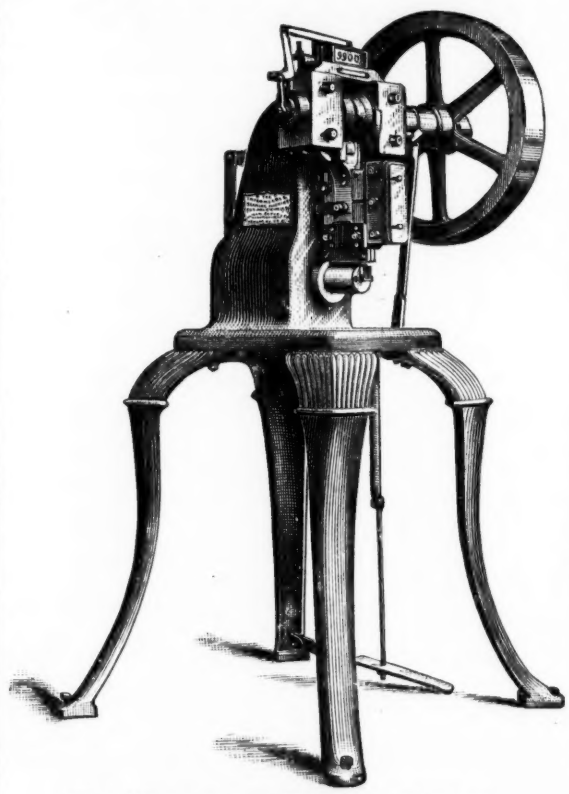
The movements of the machinery are timed so that the two inner portions of the double dies now strike together forming a hammer and anvil, thus forcibly compressing the seam and completing it, as shown in Fig. (3).

These movements are so nearly instantaneous, that, to the ordinary observer, it appears to be but one stamping.

The manufacturers have taken out in all four patents, covering twenty-one claims on the machinery, and on seams made with five thicknesses on both sides, five on one side and four on the other, and with four on one side and three on the other, and covering this form and style of joint in stovepipe, cans, cylinders, boxes, and vessels of all kinds.

The importance of an air-tight seam, without the use of solder, is at once apparent; especially for the packing of fruits, vegetables, meat, etc., where the objectionable taste from the solder deters many from using the otherwise palatable food.

The New York *Herald* of the 21st October, contained an account of a family in Carlsruhe, Baden, Germany, who had been poisoned by eating American canned beef, and it was stated that the German Government had interdicted the importation of all preserved meats from the United States. The meat by which the accident was caused was of excellent quality, but was rendered poisonous by the lead used to solder it.



THE "IMPERMEABLE" SEAMING MACHINE.

FIG. 1.

FIG. 2.

FIG. 3.

Mr. M. P. Sayce, the business manager, has at his office, 29 Chambers street, New York, cans containing peaches, asparagus, etc., packed without the use of any solder on the seams, which are in excellent condition. We have seen a great variety of boxes, cans, decorated tin goods, etc., made with the different modifications of this form of joint.

Some are now using this joint, and making it in four operations, so the great saving of time and labor by employing the "Impermeable" Machine is manifest.

Starting Street Cars.

Some genius has revived the old idea of utilizing the power of a coiled spring, as an aid in starting street cars, taking advantage of the fact that, ordinarily, in stopping the car, a large amount of power goes to waste, which, if applied, should materially lighten the work of the weary horse or ardent mule. The spring is compressed by the stoppage of the car, and is released again as it is started, not only acting upon the wheels in ordinary travel, but assisting materially in taking cars up a steep grade, as the down grade power is, so to speak, bottled up for a beneficent future use. When cars are heavily loaded with passengers, especially if loaded on the strap-hanging plan, the horses are severely taxed, and a means of helping them artificially would be a real benefaction to the animals, as well as a positive economy to their owners.

Gen. W. P. Trowbridge, Professor of Engineering in Columbia College, New York, and formerly a Professor in the Sheffield Scientific School of Yale College, has been appointed the special agent of the Census Office for the purpose of obtaining the statistics of power and machinery employed in productive industry. For such an inquiry no provision was made in the Act of 1850, and this was a grave omission. A statement of the number of operatives engaged in any branch of the national industry, or in that industry as a whole, signifies but little, unless with it are given the amount of labor-saving machinery in use, and the amount of steam and water power applied to production, by which the labor of these operatives is assisted. A novel and valuable feature of the census of 1870 was the returns to inquiries respecting the kind of power in use in each establishment of productive industry, the number of engines or water-wheels, and their aggregate horse-power. The field will be thoroughly covered for the census of 1880. Trained assistants of Gen. Trowbridge are already actively at work upon it.

Minnesota Water Power.

It is said that the water power on Minnesota streams, including that furnished by the Falls of St. Anthony, is rapidly decreasing, owing, most probably, to the changes caused by the settling up of the country, and manufacturers, who have, heretofore, relied exclusively upon water power, are putting in steam engines as an auxiliary.

New Steam Flue Cleaner.

The steam flue cleaner shown in the accompanying cut consists of a brass head 1 and 2, a piece of gas pipe 3, a brass T 5, to which is attached a piece of steam hose 6, and a wooden handle 7. The handle is screwed into the pipe. The steam hose is clamped to the T 5, by the brass clamp 4. The part marked 1 is a tapered cone projecting beyond the steam outlet on the exterior surface. Inside cone 2, designated by letter *a*, is a series of spiral grooves which give the steam a spiral motion the same as the twist of an auger. These are arranged to throw the steam directly to the surface of the flue in a thin sheet. Upon the inside of the tapered cone 2 is a tempered seat (shown by letter B), fitting the spiral grooves on cone A, between which steam passes. The outside of cone 2 is made to fit the flue between steam outlet and large end, which prevents the cold air from rushing into the vacuum and condensing the steam, thereby allowing flues of any length to be cleaned. The steam hose 6 is connected to a piece of pipe in the boiler. Steam is turned on lightly at first and the front of boiler is cleaned, also stack or chimney; the head is entered into the flue and steam turned on. The cleaner is left in the flue from one to two seconds. Several sizes are made by the manufacturers, Aitcheson & Doolittle, 36 South Water St., Cleveland, O. They extend from ⅞" to 4½".

Watson's Portable Forge.

The forge herewith illustrated is made by the Cleveland Steam Gauge Co., Cleveland, Ohio, and differs from any other in the construction of the machinery which drives the fan. It consists of a gear-wheel and pinion to drive the counter-shaft, from which a belt, one inch wide, runs on a pulley to the pulley on the fan. It will drive the fan when slack, which cannot be done on forges where

a round belt is used. No cinders or dirt can fall into the bearings. The crane containing all the machinery can be swung under the center of the forge, thus preventing breakage while being transported.

This forge has steel shafts which run in brass bushings, and is claimed to give a stronger blast than any other forge made. It is made in several sizes.

The tables were handsomely turned on a builder of silk machinery from Macclesfield, England, who visited the mills in New Jersey lately, in search of a market for his machinery. He found Paterson mills building their own machinery on models quite equal to his own, and adapting to it all the various goods for which there is a steady sale. So well established was the silk industry in all its branches found to be that the Macclesfield builder decided to settle in Paterson himself, and, in company with two of his countrymen, to build there two large additional mills the coming year, bringing several hundred Macclesfield silk workers with them. This is a practical answer to a libel uttered by Fernando Wood lately in a speech before the Chamber of Commerce in Lyons, in which he spoke of silk weaving in the United States as "an illegitimate child, destined to bring disgrace upon its parentage by its selfishness and improvidence."—*Manufacturers' Review.*

The *Railway Age* says: Master mechanics seem to be reaching the conclusion that steel fire boxes are a failure, and the substitution of copper is going on.

"Alcohol will clean silver." "Yes," remarks the Cincinnati *Saturday Night*, "alcohol well stuck to, will clean out all the silver you have got."

Paris has now 15,000 meters of tubing laid down under the main thoroughfares, for the purpose of unifying the time of all the public clocks, and setting them all by Observatory time. These pneumatic clocks will also be placed in private houses, and in future the time of day will be laid on just as is done with gas and water.

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Interest in Mechanical Matters.

The increasing interest of all classes of intelligent people in mechanical progress is one of the most gratifying signs of the times. In bygone days every individual was supposed to seek only such sources of information as applied directly to his particular business, save only the perusal of current newspapers and a few miscellaneous books. It would then have been thought a waste of time for one not in a mechanical pursuit to devote any effort to inquiring into the principles of mechanism, or to the latest developments of mechanical research. But, since machinery is used in producing almost everything necessary or desirable for mankind, a knowledge of what is being accomplished in that direction is regarded by most men of enterprise as worth considerable time and study. The tendency toward an extended popular interest in mechanical progress crops out--not only in an increasing interest manifested in journals devoted to matters of this class, but in the larger space set apart for mechanical information in the leading daily and weekly newspapers and monthly magazines. Among the better class of readers the kind of "literature" presented in those periodicals filled with flashy romances, blood-curdling yarns, and sentimental swash, which has been most widely circulated throughout this country, is losing its attractions, and its place is being filled with printed matter of a more valuable character, a large share of which is "scientific" or mechanical.

The fact is every day being brought out into bolder relief, that a person may gain some very interesting and useful information concerning the operations of machinery and tools, without being able to run a machine or superintend shop work. This information may at times prove of great value to its possessor. The kind of information known as "scientific," formerly applied only to truth attained by a course of methodical study; a knowledge of laws, principles, and relations, that is technical knowledge; but by usage (or abuse) in many periodicals it has lately been made to include almost everything, whether a thanksgiving story of the great sea serpent, or a description of the latest improved five-legged calf. The intelligent, self-thinking reader will be able to sift purely scientific information, such, for instance, as relates to mechanical matters, from the worthless stuff sent out as the reflections of science. Although science embraces many departments, the truths of mechanics will be found closely involved in every step taken in its investigation throughout its whole extent.

Time Wasted.

Judging by a review of the Patent Office Reports, there are a large number of persons who fancy that the mere possession of a patent is a short and sure road to wealth. On no other basis can we account for the issue of so many which are of no intrinsic value, and can never, in the ordinary course of events, commend themselves to the world. Nearly every article of wearing apparel, all mechanical utensils, and domestic as well; articles of luxury, medicines, food, and toys, are covered by patents on patents, and the majority of them so useless, that one wonders that the Government can sanction the issue of papers for them. The caption of this article expresses the value of ninety-nine out of a hundred of them. Supposing that one in a hundred has merit, the amount of labor that has to be done before it can be brought into general use is inconceivable to those who have had no experience in this direction. Other interests, likely to be affected by the introduction of the new candidate for fame and wealth, have to be dethroned and supplanted; the public has to be educated to believe in the merits of the new article. Expensive advertising, and agents' salaries have to be paid, and an amount of capital embarked, that, with the same amount of energy, would insure its possessor a handsome return from selling peanuts on street corners. Even then, results are extremely uncertain, and this being true where a really useful article is introduced, what is the prospect where useless ones are brought forward? It is simply time wasted to work on them.

Many persons read the biographies of men of genius and are straightway fired with an ambition to excel them; just as the farmer's boy, seeing the antics of the acrobat, tries to emulate him in the retirement of the haymow; but the amateur scientist and amateur acrobat achieve ignoble falls, and are wiser when their wisdom is of no avail.

There are men born to invent, with a faculty for it, who will pursue such callings in obedience to the bent of their minds, through all failure and privation; and of these two they have, in most cases, enough and to spare. They originate because they must, as the poet writes, or the painter paints; but the most of these die in harness as poor as poverty personified. But the amateur inventor of double-back-action spades, or self-propelling tooth-brushes, or of three-pronged teaspoons, cannot plead the spur of any such unfortunate birth-mark; he has only himself to blame, and our advice is, to persons about to invent, the same as *Punch's* to persons about to marry, "Don't."

A New Mechanical School.

Some two years since, a drawing school was established in Philadelphia in connection with the Spring Garden Institute. Starting with twenty pupils, it has met with such success (having now 332 names on its rolls) that its plan and scope are to be broadened into a complete mechanical school, which is intended to fill up the theoretical and practical gaps in the training of apprentices, which cannot, ordinarily, be filled in shops run on the piece-work plan.

The proposed school is to be divided into two sections, comprising wood and metal working, respectively. The wood-working department includes the theory and practice of carpentry and joining, wood turning, cabinet and pattern making; while the metal-working department comprises forging and foundry, vise and machine tool work. Of these, the course combining the various branches of vise work would naturally come first, as most suitable for beginners, the other departments following in due order. Shops for mechanical practice form an important adjunct to the plan, while the advantages to be derived from practical lectures, by well-equipped mechanical engineers, will also receive due consideration. Night and day classes will be organized, and all benches, tools and materials will be furnished by the institute without any expense to learners, beyond the regular tuition fees, which are to be moderate—viz., five dollars per term of ten weeks each.

The vise class will be taught by a skilled workman of many years' experience, and the classes will consist of ten pupils each, with vise accommodations and tools for ten at a time, enabling learners to pick up points of knowledge and suggestion in an evening, without hindrance to their daily duties, which they might be wholly unable to find out for themselves in the shop.

As no previous knowledge of the handling of tools is required, many parents will find these classes of advantage in determining whether their sons are adapted to mechanical pursuits or not, and to what branches, if any—a most important object. The schools will be in charge of Dr. Robert Grimshaw, aided by a sub-committee of gentlemen prominently connected with Philadelphia machinery interests, and, aiming at a noble purpose, will, doubtless, merit and meet with continued success.

Discussion on Standard Systems of Screw Threads.

A meeting of the Master Car Builders' Association was held at No. 113 Liberty St., in this city on the 18th ult., for the purpose of discussing measures to be adopted in order to introduce a uniform system of diameters of screws and bolts, also a universal pitch of threads to be used upon all railroads. The New York Central and Hudson River R.R., for instance, haul cars over their lines which are owned by about four hundred different companies. If a nut is lost from a bolt it is hardly possible to find a nut to fit that bolt, from the fact that the nut and bolt are of a different diameter, though designated the same. From this single illustration a person can easily see the great difficulties and expense usually met with on railroads that run "foreign" cars. These and other interesting points were brought out during the course of the meeting. The president of the Association, Mr. Garey, called the meeting to order, and introduced Mr. Chanute, Superintendent of the New York, Lake Erie and Western R R., who briefly addressed the meeting, after which Wm. Sellers of Philadelphia, the originator of the U. S. Standard or Franklin Institute system of screw threads, delivered an address. He was followed by Mr. Stetson, of the Morse Twist Drill Co., and others. A full report of the discussion will be given in our next issue, as the matter is now in the hands of the different speakers for correction.

American Watches.

Every one of the six or eight watch factories in this country is driven to its fullest capacity to supply the demand. In the face of recent enlargements, most of them are far behind their orders. But a few years ago, American watches were, by most people, considered much inferior to those of Swiss manufacture. This prejudice, like many others in favor of foreign-made articles, is rapidly fading away before the incontrovertible logic of actual experience. The greater portion of those imported from the other side of the Atlantic are inclined to become unreliable after limited usage. With a superior system of manufacture, and the aid of a protective tariff, it is not surprising that American watch factories can supply a better article for a given price than the agents of foreign makers.

Social Ethics in Machine Shops.

Humility is doubtless a very good thing in its way, but there is a sort of pseudo-humility which does not stop far short of self-imposed injustice. And right here is exactly the point at which too many men employed in mechanical pursuits make the serious mistake of undervaluing their own position and usefulness.

Mechanics should consider that the world is very prone to value men at their own appraisement, and should govern themselves accordingly. The notion that there is any essential difference between the social status of the banker or merchant and that of the master mechanic, is largely a notion derived from the tacit consent of the latter, and can be removed by a proper degree of resolute self-assertion upon his part. The notion that a bank clerk, or mercantile attache, who works with brain and pen is any better, socially, than a practical mechanic who works with head and hands, is one whose falsity the mechanic alone has power to prove.

The chief stumbling-block is, perhaps, the great proportion of mechanics who are content to let others do their thinking for them, and thus, in time, come tacitly to regard themselves and to cause others to regard them as mere human machines. But those mechanics who propose having a tub of their own to stand on, if they cannot at once arouse their shop-mates and fellow workers to a full sense of their duty, in this direction, can, at least, clear their own paths of the social bugaboos, to which too many have quietly and unnecessarily submitted in advance. But how is this to be done? By doing as other ambitious men do. By posting themselves thoroughly in their business and rising in it; by informing themselves of what is going on in the world, and preserving a proper measure of dignity and self-respect in their intercourse with others; by avoiding slatternly and vulgar personal habits, and by adopting such other kindred methods of life as their

own good sense will be likely to indicate, if they turn to it for guidance.

Large Fly Wheels.

Much has been said of late in reference to a certain large gear wheel, 20 feet in diameter, which was lately cast in Paterson, N. J., for use in a sugar mill, and we think that some of our readers would perhaps like a few items of this kind for reference. The fly wheel attached to the engine of the Lawrence Manufacturing Co., at Lawrence, Mass.. is 30 feet in diameter, with 74″ face, and runs at a speed of 60 revolutions per minute. On the face of this wheel are three belts, two of which are 25″ wide, and one 30″ wide. The weight is about 40 tons. The Atlantic Mills, located at Olneyville, R. I., have a gear wheel attached to their engine 25 feet in diameter, with a face 24″ wide. This wheel is composed of twelve segments; the diametrical pitch is 24 ft. 9.104″; number of teeth, 180; pitch of teeth, 5.183″; speed, 52½ revolutions per minute. This wheel transmits power to a jack 8 feet 6.31″ pitch, having 62 teeth. It was started July 9th, 1879.

The Conant Thread Co., Pawtucket, R.I., have an engine with a shaft 26 ft. 11″ long, upon which are two wheels, 30 ft. in diameter. One of these wheels has a face 7 ft. 4″ wide, while the other has a face 7 ft. 6″ wide. The former has two belts running upon it 42″ wide, and the latter has two 26″ and one 32″ wide. These wheels weigh 100 tons and run at a speed of 42 revolutions per minute. The Wamsutta Mills, at New Bedford, have a gear fly wheel 30 ft. in diameter, with a 24″ face, weighing 56 tons, and running about 34 revolutions per minute.

The diameter of the fly wheel of the Centennial engine was 30 ft.; width of face, 2 ft.; number of teeth, 216; weight, 56 tons. This enormous gear, running at the speed given, ran so still that a conversation could be carried on in a low tone of voice near it without inconvenience. It was also a great curiosity to our foreign visitors who would not believe that it was a cut gear until the engine stopped and they were allowed to inspect it. The teeth fitted so nicely, that, it is said, they would pinch tissue paper when placed between them.

LITERARY NOTES.

A CATECHISM OF THE MARINE STEAM ENGINE, for the use of engineers, firemen, and mechanics. A practical work for practical men. By Emory Edwards, Mechanical Engineer. Illustrated by sixty engravings, including examples of the most modern engines. 374 pages, 12mo., cloth; price, $2.00. Postage free to any part of the U. S. Published by Henry Carey Baird & Co., 810 Walnut St., Philadelphia, Penn.

This book was written exclusively for the benefit of young engineers and mechanics, or those contemplating the adoption of the profession of marine engineering. The author is a thorough practical man, and during his experience has acquired the knowledge which forms this book, and a practical man is considered the most competent to judge of what the practical mechanic and engineer most needs to advance him in his business. It is plainly written, without superfluous matter. In this book the secrets of marine engineering are said to have leaked out, which will, no doubt, please those who are now advancing themselves in that profession.

We notice that the author starts off with the plan of questions and answers (which has been advocated frequently in our columns as the best method of teaching). The first questions are in regard to qualifications, and then how to qualify a person, and course to pursue to become an engineer. Questions relating to boilers are very instructive, pointing out many of the leading defects in the design and construction, and showing the best practical arrangement of tubes to obtain the best results. The use of the hydrometer and salinometer are practically explained, showing how to determine the saltness of the water, while the most direct causes of corrosion are explained from the reports of different investigations, and the simple means employed to prevent the same. A paper on the Use of High Pressure Steam in Ocean Steamers, by J. F. Flannery, which was one of the best read before the Association of Engineers in England last April, has been copied in full. It is valuable and interesting. Some of the most direct causes of boiler explosions are given, which tend to remove much of the mystery connected with boiler explosions.

We are glad to see that the author advocates the use of the injector in feeding boilers instead of a pump, to avoid the injury caused to boilers by pumping in cold water.

Extracts from different papers on the advantages and disadvantages of the compound engine are worthy of close study by the practical engineer, and are illustrated by appropriate cuts. The most simple form of the indicator is described, together with specimens of diagrams, which are analyzed in a plain practical way. Directions are also given as to the setting of valves, ascertaining the H. P. of engines by simple arithmetic. Lining up engines, causes, emergencies, etc., are all described in their proper connections.

The marine engines, both simple and compound, are described, giving the names of the different parts, and are illustrated by complete and detail drawings. These engine are of the modern types, and represent those manufactured by some of the leading builders in this country, and in England. The surface condenser of the H. B. M. sloop Pelican is worthy of close investigation, on account of the novel construction and operation The engines are of the Perkins compound, which pattern, among the others, have some remarkable qualities in them.

The cuts are in some cases not so clear as they might be, and the printing might be a little cleaner. But the type is of good size, and, taken as a whole, the book will, no doubt, prove very beneficial and attractive to those for whom it is intended.

Mills' Directory of Steam Engines and Boiler owners for N. Y. City and Brooklyn, N. Y. 100 pp., price $3. James N. Mills, 165 Broadway, New York.

This book is a venture in a new field, and a very creditable one. It gives, by streets and districts, the names of owners of steam power in both cities, also the names of the engineers of the various establishments in New York City. It therefore gives information that can not be obtained from other directories. Its value is evident. The author intends to publish a book of the same kind, embracing all New York State, except N. Y. City and Brooklyn, also one of Philadelphia and Baltimore, and others.

Business Specials.

Forty cents a line for each insertion under this head.

Manual of Power for Machines, Shafts, and Belts, with the History of Cotton Manufacture in the United States, by Samuel Webber, C. E., copyrighted 1879. Only work of the kind extant; 240 pages. Price $3. Address, D. Appleton & Co, New York, or the author, Manchester, N. H.

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Questions and Answers.

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly and according to common sense methods.

(1) O. R., Newark, N. J., writes: Will you please inform me how to fasten thin leather on pulleys securely? *A.*—Procure one ounce of caoutchouc (pure or native rubber, which may be had of any druggist) and cut it into thin slices, place it in a tinned sheet iron vessel with six or seven ounces of sulphide of carbon; the vessel is then to be placed in a water tank previously heated to about 86° Fahr. To prevent the solution from becoming thick and unmanageable, mix with a solution consisting of spirits of turpentine, in which half an ounce of caoutchouc in shreds has been dissolved over a slow fire, and then a quarter of an ounce of powdered resin; from an ounce and a half to two ounces of turpentine being afterward stirred in, to be added in small quantities. This cement must be kept in a large mouthed bottle well corked, and in using clean the parts to be united thoroughly with benzine; apply two coats of cement, allowing each to dry before applying the next; when applying the last coat allow the cement to dry so as to become very sticky, then press the surfaces firmly together and allow to thoroughly dry. This is waterproof. A cheaper, though good cement and not waterproof, is made as follows: Dissolve glue in boiling water, making it of the same consistency of cabinet-makers' glue; then add, while stirring, a sufficient quantity of wood ashes (previously sifted through a fine sieve) to produce a varnish-like mixture. While hot, the cement must be spread evenly over the surfaces to be united, and firmly pressed together. When thoroughly dry, the article is ready for use. This cement may be used for uniting wood with metals, glass, stone, etc.

(2) G. B., South Newmarket, N.H., writes: In your edition dated Oct. 18, 1879, E. H. Robbins gives a rule for finding the H.P. of an engine. I would like to ask Mr. Robbins how he multiplies 636 ×219×90 and divides by 33,000 and obtains 38 for an answer? *A.*—Mr. Robbins claims 38 as the nearest answer, as it is only a fraction less, as you will see by carefully reading his article. *Q.*—Please give me the correct rule for finding the H.P. of an engine? *A.*—This question was answered in our issue of Oct. 11, 1879, answer to question (3). The average mean effective pressure in the cylinder seldom rises above 35 lbs. per square inch, notwithstanding some rules use full boiler pressure.

(3) L. O. C., Sedalia, Mo., writes: Will you tell me tha best way to splice a rope to hoist a hogshead of sugar, or its weight, for store elevator? —*A.* If the rope is to run through a sheave, it should be put together with a long splice, which can be made of any suitable length, and, if properly done, leaves the rope smooth. The strands must be unlayed one foot, or more, according to the size of the rope, and the ends butted together so that each of the strands fit between those of the opposite end; then unlay any one of the strands, and, as fast as it is unlayed follow up with the strand belonging to the opposite end, until near the end when the ends are to be tucked over and under each other as in tying a half knot. The ends must be tucked across the strands, or at right angles with them. After the operation described is finished with the first two strands, proceed in the same manner with the others, and keep the joints equal distances from each other. After tying the ends they may be split and tucked over and under the strands one or two times, the latter being generally used. A short splice may be used in cases where the rope does not run through a sheave, as it takes up less rope. It makes a lump on the rope, however, and is not as good a job. The strands are to be unlayed six to eight inches, and the ends of the rope are to be butted together; then tuck each strand over and under each successive strand, either two or three times, as may be desired; the ends may finally be divided, in order to taper off the end of the splice, instead of ending abruptly.

MANUFACTURES.

The Pratt & Whitney Co., Hartford, Conn., are now employing nearly 500 men and are adding to the force nearly every day. Those who during the dull timed fooled away their money for poor, low priced machinery are now sending it to the junk shop and supplying themselves with first class mechanism.

By a vote of the stockholders, the Hartford Foundry and Machine Company will wind up its business January 31, 1880, and offers its large stock of tools for sale.

J. Barton Smith & Co., manufacturers of files and rasps, Philadelphia, are very busy and behind orders three months. They are building a new three-story shop, which they expect to occupy soon.

A hoe factory, with a capacity of twelve hundred a day is in process of erection at Monongahela City, Pa.

The harness makers of Chicago are subscribing stock to start a large co-operative shop, and the project meets with remarkable success. It is on the plan of the St. Louis Furniture Workers' Association.

The Troy, N. Y., steel rail mill employs two thousand six hundred men, and produces two hundred and fifty tons of steel rails daily.

The rolling mill near Lynchburg, Va., recently bought by the James River Steel Manufacturing and Mining Company, of which Ex-Governor Hartranft is president, will be put into operation at once, and plans have been prepared for a large new furnace to be erected near it.

The Crompton Company, of Crompton, R. I., are laying the foundation for a new stone mill, to be erected in the spring of 1880, doubling their present capacity.

The Rhode Island locomotive works are to build twenty-five engines for the Manhattan railroad company.

Thirty machinists left the city of Providence last week for Orange, Mass., where they are employed by the Gold Medal Sewing Machine Company.

G. W. Brown, Providence, R. I., feels the improvement in business in the increased demand for his Patent Foot Power Machinery. Orders for 30 jewelers' polishing lathes, and 25 circular saws, received from one firm last week are to be shipped to England.

If there is any place that wants the starch taken out of it, it is Aroostook, Maine. The starch factories there are all closed, having had an unusual long run, and the storehouses are crowded with starch waiting transportation.—*Boston Com. Bulletin.*

Sagendorph's mill will be started at East Brookfield, Mass, running three sets of woolen machinery, about March 1st, 1880.

Lydall & Foulds of Manchester, Conn., are to commence immediately the erection of a paper mill to replace the old mill of the Pitkin M'fg. Co., which was burned about a year ago.

Charles Saylor has begun the erection of a large planing mill at Jalappa, and expects it to be ready for work about February 1, 1880. The building will be 40 feet wide by 80 feet long.

The Cutler Manufacturing Company, of Warren, R. I., have voted to erect a new mill for the manufacture of cotton yarn, in extension of their present business. The structure will be about two hundred and fifty feet in length, eighty feet wide, and two stories high, and have a capacity one-third greater than the old mill.

W. E. Whitman, of Winthrop, Me., manufacturer of agricultural implements, will next season increase his works, and employ additional workmen.

Two large packing houses, two or more large flouring-mills, a shot-tower, another white-lead manufactory, paper-mills, and two more elevators will be built next season at Kansas City, Mo.

Large brick woolen mills are to be erected at San Francisco, Cal., by Donald McLellan.

A new co-operative boot and shoe company, of Milford, Mass., is to be formed at once.

H. P. & E. Day are building a three story addition 50×30 feet at their large brick rubber factory at Seymour, Conn.

It is stated that the new torpedo boat built at Bristol by the Herreschoff Manufacturing Company, of Bristol, R. I. is for the Peruvian navy.

The Social Manufacturing Campany, of Woonsocket, R. I., have voluntarily advanced the wages of their employees.

It is stated that a large party of machinists from the Pottsville, Pa., shops propose emigrating to Atlanta, Georgia.

It is said that the Messrs. Coats, of spool thread fame, are thinking of epecting spool factories in Maine.

Eight immense boilers have been put in the new addition to the Buckeye Works, and will furnish power for the 150 horse power Corliss engine, which is soon to be set up.—*Akron, O., City Times.*

It is to be hoped that with careful management these boilers, all working at the same time, will generate steam enough to keep the engine running steadily.

The Racine Hardware Company, of Racine, Wis., are building immense works at Racine Junction. The rapidity of their growth is one of the marked features of the city in which their works are located.

The Forest City Brass Foundry is the name of a new firm who have just located at No. 4 Champlain street, Cleveland, Ohio.

Old sledge is still the favorite game with most blacksmiths.

The Jarvis Furnace Co., Boston, Mass., are having excellent success with their furnace in burning wet peat, coal-dust, wet hops, sawdust, horse-manure, and other substances that would otherwise be wasted. It operates upon the same principle as the Siemens-Martin process of making steel by utilizing the waste gases.

The Pennsylvania Railroad Company are constructing the largest elevator in the world at Jersey City. The 7,200 twenty-two inch cups will require 50,000 pounds of iron.

Livingston & Co., iron founders, Pittsburgh, Pa., write us: "We have all we can do for the next three months, and have been refusing orders for some weeks."

The St. Louis association of boiler makers and sheet iron workers threatens a strike if wages are not advanced 15 per cent. before the first of January.

A Reading firm offers to build a nail factory at Mansfield, Tioga County, Pa., at a cost of $25,000, with a capacity equal to the production of 200 kegs of nails every 24 hours, if the citizens of that place will take two-thirds of the stock.

The National Furnace Improvement Company, of Chicago, recently incorporated under the laws of Illinois, has for its object the sale of an attachment for furnaces, by means of which, it is claimed, from 20 to 40 per cent. of fuel is saved.

Joseph White and William Davis, of Cleveland, backed by heavy capitalists of that place, have leased the Nes Silicon Steel Works, at Sandusky, O , which have been idle for several years. New machinery will be introduced and a strong effort made to render the works remunerative.

The Chicago Steam Forge Works, Willard, Sons & Bell, proprietors, find the demand for car and locomotive axles so great that they are obliged to run fifteen hours per day. They report a good demand for engine, mill and steamboat shafting. The works present an unusually lively appearance.

The foundations of a new grain elevator, to hold 750,000 bushels, are now being laid at St. Paul, Minn.

Thornely & Ott, formerly connected with the "Pioneer Foundry," have commenced the erection of buildings at La Crosse, Wis., to engage in a general mill furnishing and machinist business. They will style their shop the "West Wisconsin Iron Works."

The Pittsburgh Bessemer Steel Co. have purchased fifty acres of land as a site for their new works. Large contracts for machinery, building material, and other necessary details have already been made, and others are being prepared.

The Pennsylvania Railroad, it is stated, will erect a new car wheel foundry at Altoona, Pa., which will have a capacity of turning out 125 wheels per diem.

A gold refinery is about to go into operation at Buffalo, N.Y., for the treatment of refractory ores by a comparatively new process.

The Enterprise Manufacturing Company, Philadelphia, which only last year enlarged their premises, are again compelled to make additions at a cost of $75,000.

The Antietam Iron Works, Maryland, not far from the famous battle-field, which were abandoned for many years, are now in successful operation—fourteen tons of pig iron being the daily product. Most of the iron made at these works is purchased by the Baltimore & Ohio Railroad Co.

The Consolidated Safety Valve Co., Boston, have shipped safety valves within a week to Florida, California, Georgia, Missouri, Nova Scotia, Canada, Wisconsin, Michigan and New York. They are supplying the Baldwin Locomotive Works, the Rogers Locomotive Works, the Danforth Locomotive Works, the Schenectady Locomotive Works, the Rhode Island Locomotive Works, and the Pennsylvania R. R. This company has just filed two bills for infringement of patents against the Crosby Gage and Valve Co. of Boston.

The Harrisburg (Pa.) Car Works have increased wages 15 to 18 cents a day, dating from November 3.

The Knowles Steam Pump Works, at Warren, Mass., propose at once to make still another addition, 35 feet in length, to their factory.

The Wisconsin Single Lever Lock Co. is a new corporation recently organized, and incorporated in Racine, Wis., for the manufacture of single lever locks for wagon brakes.

The co-operative foundry, Beaver Falls, Pa., in addition to all they have manufactured this summer and fall, have sold off the immense stock they have accumulated during the dull times, and still the orders come in.

A number of Ohio capitalists have been in Lynchburg lately, looking up a site for a rolling mill to be built in case the new proposed railway along the James River valley is definitely determined upon.

Poole & Hunt, Baltimore, Md., are just finishing four large Leffel Turbine Wheels with all appointments, aggregating about 1,000 horse power, for the Fall Mountain Paper Co., of Bellows Falls, Vt.

The New York, Lake Erie and Western R. R. is about to add 3000 29-foot box cars, Class A., to its equipment. Of these, 1000 will be built by McKee & Fuller, Catasauqua, 500 by the Lebanon Manufacturing Company, 300 by F. Gardner & Co., Carlisle, and W. C. Allison & Co., Philadelphia.

James P. Wood & Co., Philadelphia, are using Prof. Humiston's new process for burning petroleum under steam boilers, also for warming and lighting their store on S. Fourth street.

Messrs. Newton & Cox of Cleveland, Ohio, continue to receive large orders for their milling machinery and engineering tools. The latter have been adopted by the State of Pennsylvania on their public works.

The Fitchburg Steam Engine Company have just finished a 14-inch cylinder engine for the new paper mill of F. H. Richmond & Co., Pawtucket, R. I.

Peoria, Ill., is agitating the question of new pumping machinery for her Water Works.

C. H. Brown & Co., Fitchburg, Mass., builders of one of the best automatic cut-off steam engines now extant, are full of orders and busy as bees.

Orders for 1500 portable engine "pop" valves have just been received by the Consolidated Safety Valve Company. This company was organized in Boston during the present year, having purchased all the patents relating to steam safety valves which had been granted to E. H. Ashcroft, of Boston and G. W. Richardson, of Troy. The new company have 35,000 of their valves in use. They have been adopted by the government after a severe test, and are in use upon leading railways in the country. The company are now making sixteen three-inch nickle-seated pop valves for the government.—*—Boston Daily Advertiser.*

D. Saunders' Sons, Yonkers, N. Y.. are shipping several six-inch pipe cutting and threading machines to the Chester Tube and Iron Co., Chester, Pa. They have had eight of them in use for some time past. One 4-inch machine has just been shipped to the American Grape Sugar Co., Buffalo.

Machinists' and Engineers' Supplies.

NEW YORK, Dec. 24, 1879.

Holiday week, and everybody busy in this line. The way of the newsgatherer is thorny in consequence. We note few actual changes.

Jobbers are stocking up on Globe Valves in anticipation of an early advance.

Opinion is divided about Iron Pipe, but indications point strongly to an advance after January 1st, on the part of manufacturers. Stocks in hands of jobbers may prevent consumers feeling the change at present.

Brass goods a nd fittings are regarded as certain to advance after January 1st.

An advance in the prices of files, both English and American, is considered imminent.

F.W. Moss, 80 John St., New York, now quotes Moss' English Files at a discount of 5 % from the $5.00 list. Until recently the discount was 5 % to 10 %.

Edward Barr, 78 John St., New York, quotes Boiler Tubes at 10 % to 20 % discount, according to size of order.

Boiler Tubes are also named as certain to advance after January 1st.

Disston's Moulders' Tools, Steel Squares, Machinists' Rules, and Machinists' Levels are now quoted 20 % discount to the trade.

Iron Review.

NEW YORK, Dec. 24, 1879.

We have no changes to note this week, the general features of the market remaining as stated last week. Business good for the time of year.

Pierson & Co., 24 Broadway, New York, quote Boiler Makers' supplies out of store: Tank Iron, 4½c.; C. No. 1 Boiler Plate, 4¾c ; C. H. No. 1 ditto, 5c.; Best Flange ditto, 6c.; Boiler Rivets, 5 to 6c.

Other Iron Supplies out of store:

No. IX Pig, $30 to $31 per ton; Iron Rails, $50 to $60, according to weight; Old Rails $34 to $35; Fish Plates, 3¾c. per lb.; Railway Spikes, 3¾c.; Bolts and Nuts, 4½c.; Common Bar Iron, 3c., basis from store; Refined,3 2-10c., basis; Ulster, 3 8-10c., basis; Machinery Steel, 7c.; Best Tool Steel, 12½c.; Norway Bar Iron, 5½c.; Norway Shapes, 6c.; Nail Rods, 6 to 6½c.; Sheet Iron, 4½c., basis; Angle Iron, 4c.; Tee Iron, 4½c; Band Iron, 3 6-10c.; Hoop Iron, 3 8-10c.; Horse Shoe Iron, 3 8-10c.; Hot Polished Shafting in lengths, 2 ft. and longer, 7 to 8c., according to size; Small Black Rivets 40% off in papers, 25% off in bulk.

Metal Review.

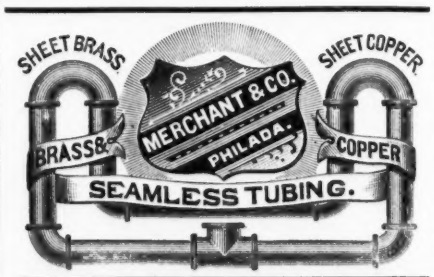
LUCIUS HART & CO., 8 & 10 Burling slip, New York, furnish us the following, under date of Dec. 24th, 1879:

Pig Tin has been dealt in to a large extent within past week, dealers and importers operating. Stocks have not been reduced by consumption. Market at close somewhat firmer. London—£91 10s. We quote Spot: Banca Tin, 24c.; Malacca and Straits, 20¾c. to 21c.; Billiton, 20½c.; English "L. and F.," 20½c.; Pig Lead firm at 5¾c. to 6c.; Antimony, 17c. to 20c., as to quality; Ingot Copper, 21¾c. on spot, 22¾c. for futures; Spelter, 6¼c. for Foreign, 6½c. Domestic;—Nickel, $1.25; No. 1 Solder, 11c.; "Half-and-half," 13c.

Situations Wanted—Help Wanted.

We will publish notices suitable for the above headings, applying to any of the machinery trades, and not to exceed four lines each (32 words), at the nominal rate of twenty-five cents for each insertion.

Manufacturers requiring the service of a Mechanical Engineer and Draughtsman, who can take the lead in designing and constructing first-class Steam Engines and Mill work, will please address A. P., AMERICAN MACHINIST, 96 Fulton Street, New York.



WANTED.

1 Hydraulic Press and Pump; Cylinder not less than 6 x 12, either combined or separate; 1 Iron Planer, to plane 5 ft. long, and 18" to 24" sq.; 1 Screw Cutting Engine Lathe, 26" to 28" swing, 6 to 8 ft. bed; 1 Drill Press (Vertical), 24" to 30" swing. Above must be in good order. Bowman Machine Company, 703 Market Street, St. Louis, Mo.

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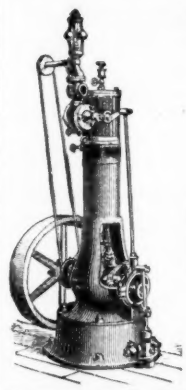

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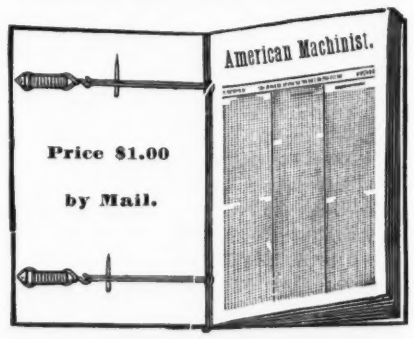
FOR THE AMERICAN MACHINIST.



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American Machinist Publishing Co.,

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Newell's Patent Universal Grinder.

IMPORTANT TO MILLERS, MINERS AND MANUFACTURERS.

This Grinder is offered to the public as a machine which has no equal for grinding grain or pulverizing quartz, phosphates, bone, cement, oyster shells, scraps, glue, fire clay, and other articles of similar nature. It is unrivaled in the amount of work it will do in any given time and in the economy of power used. It is a point of great merit that our mill delivers a perfectly ***GRANULATED*** article. In grinding grain the meal ***IS NOT HEATED,*** and consequently may be bagged at the delivery spout with no danger of fermentation, and without the loss of weight incidental to the product when heated in grinding. It is estimated that the usual shrinkage is sufficient to cover the entire expense of grinding by this mill. We have ground, bolted for fine feed, through 13 mesh, weighed and bagged up ***six thousand five hundred (6500) pounds of corn per hour*** with not more than 15-horse power. It is compact, portable and not expensive. A cordial invitation is extended to all parties to call and see the machine at work at

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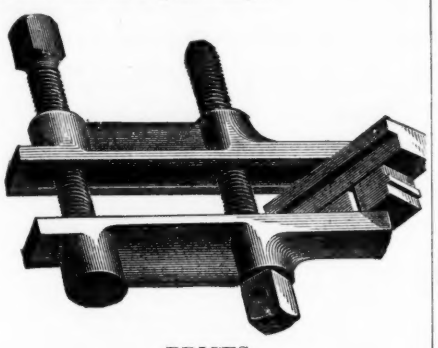

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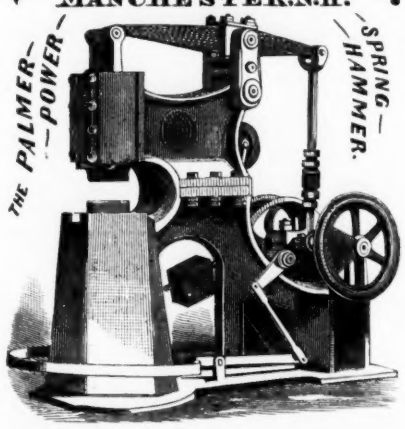

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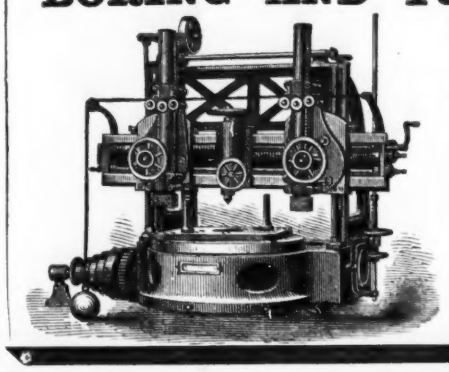

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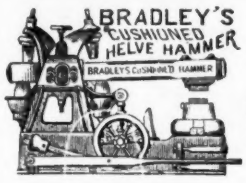

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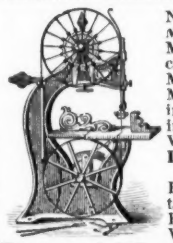

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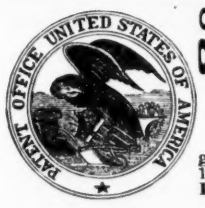

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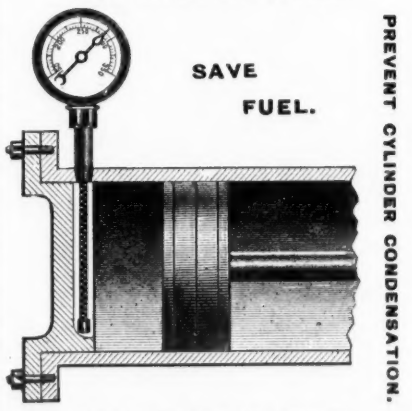

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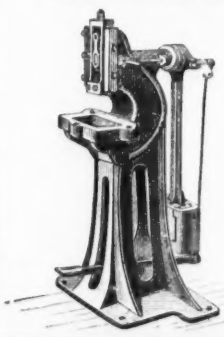

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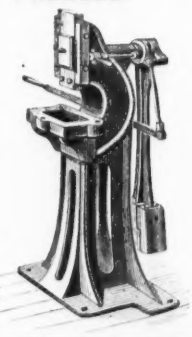

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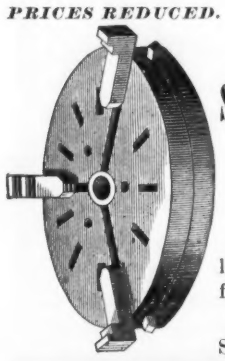

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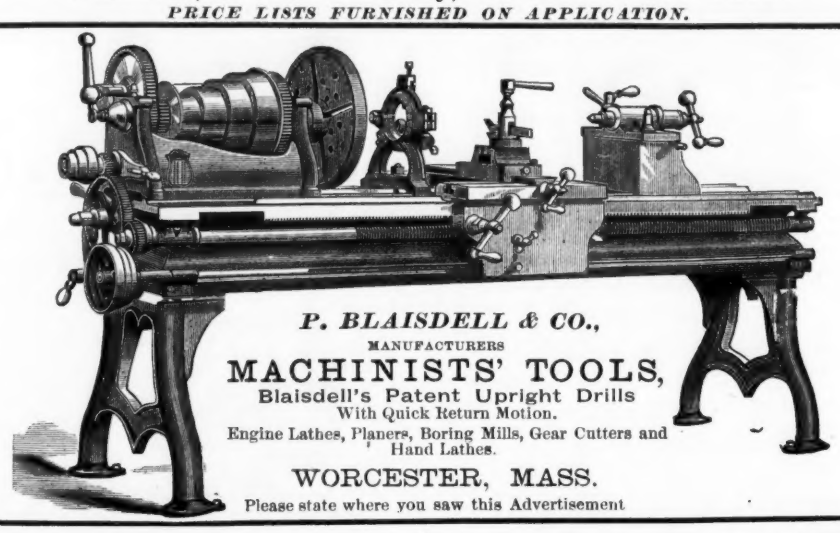

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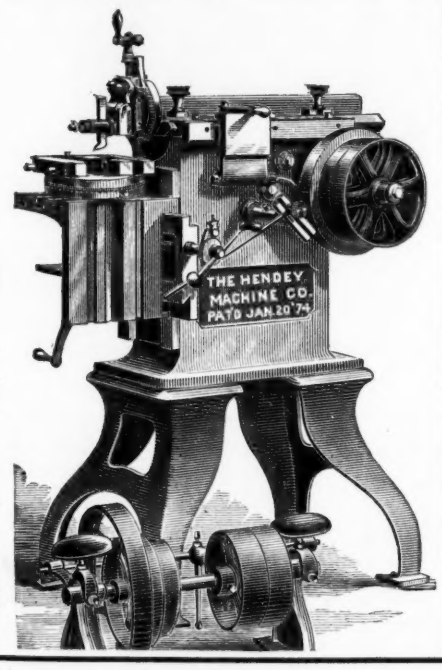

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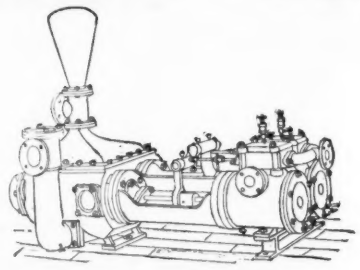

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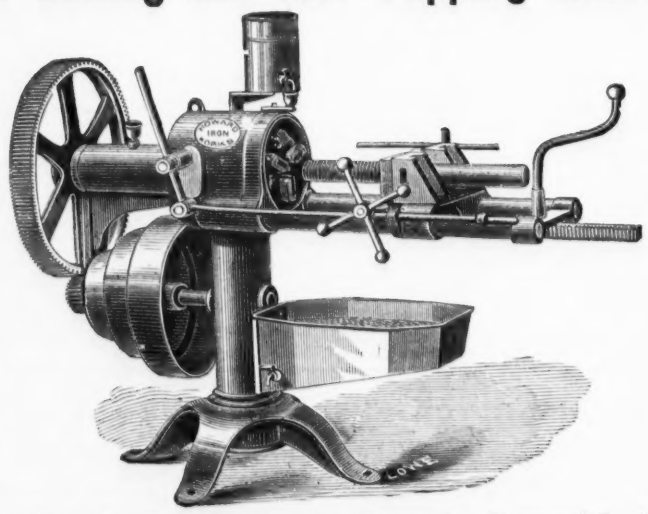

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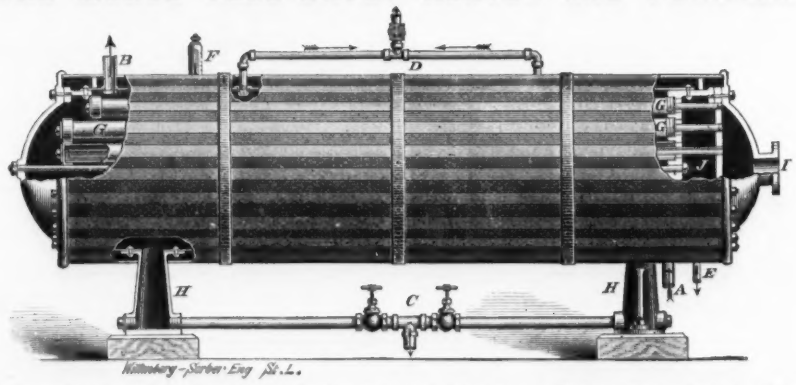

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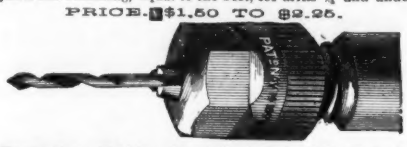

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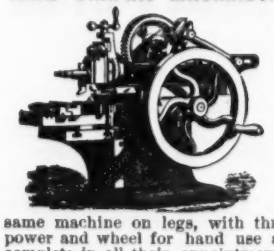

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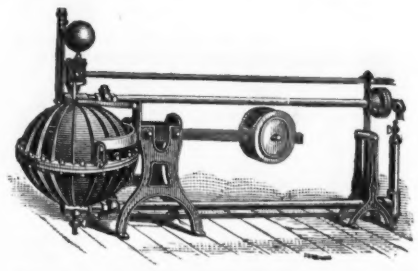

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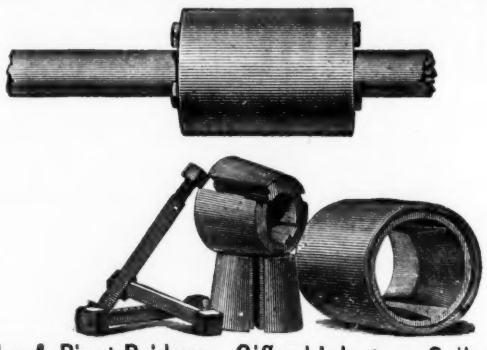

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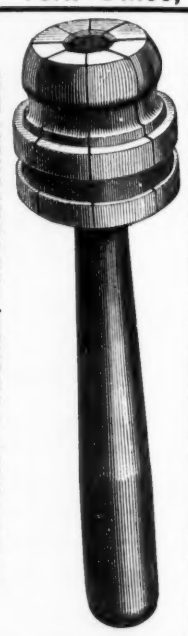

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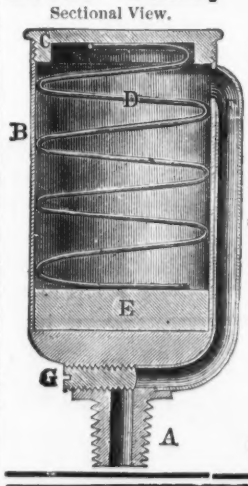

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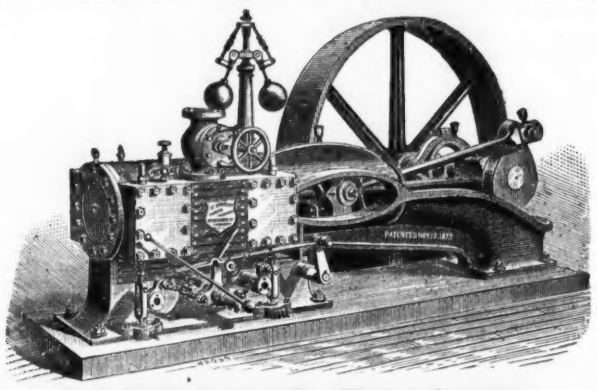

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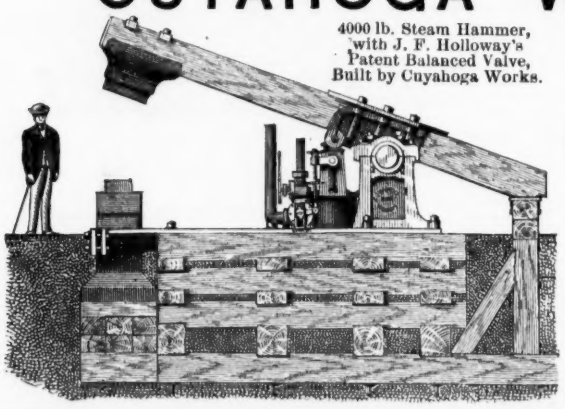

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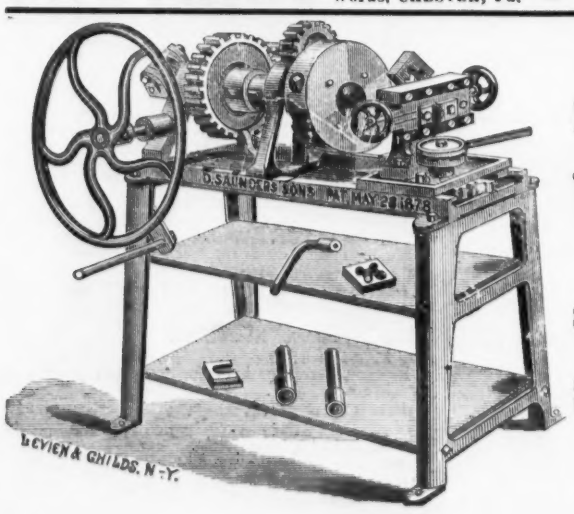

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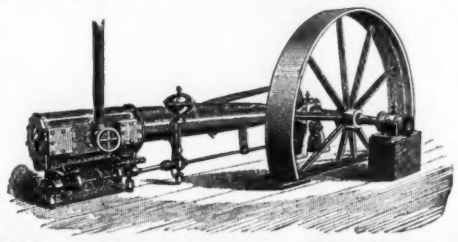

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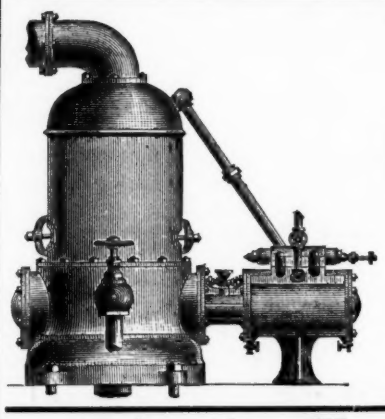
Yours truly, T. A. MAHAN,
1st Lieut. Engineers.

[We desire to call particular attention to the above letter, as since it was received by us, Lieut. Mahan has confirmed his good opinion of our Engines therein expressed, by ordering two more of them.]



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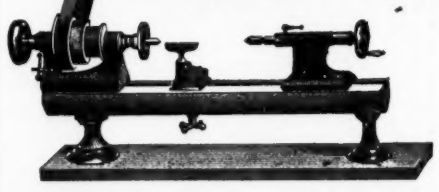

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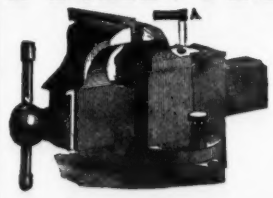

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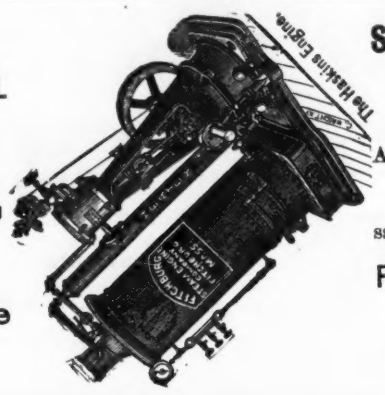

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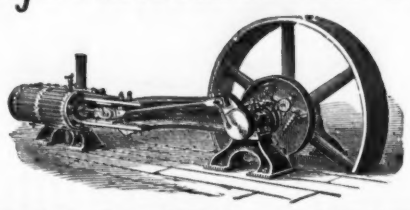

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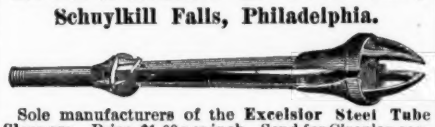

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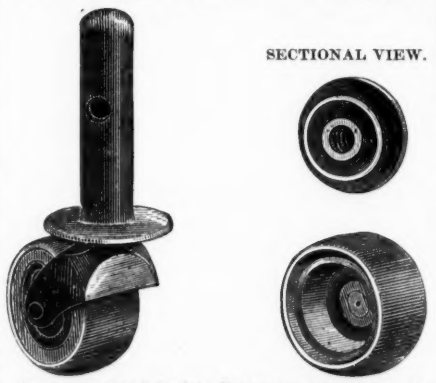

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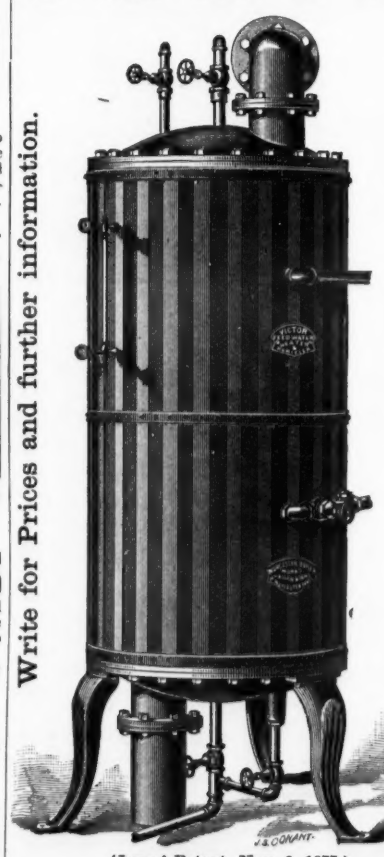

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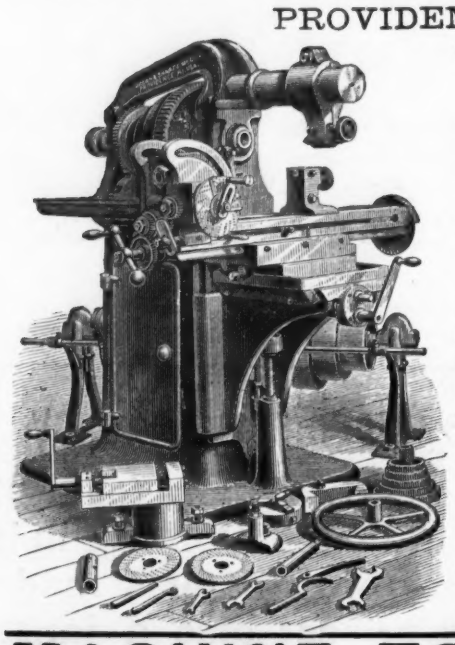

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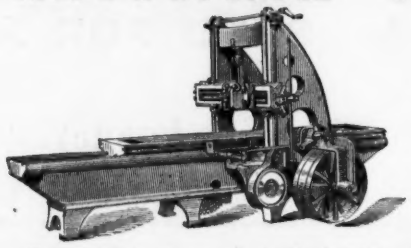

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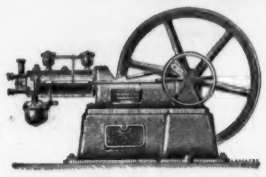

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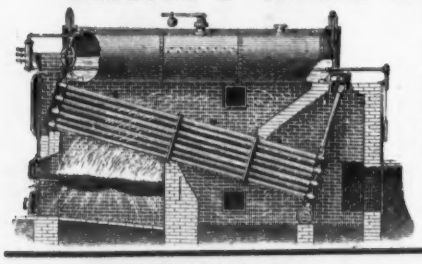

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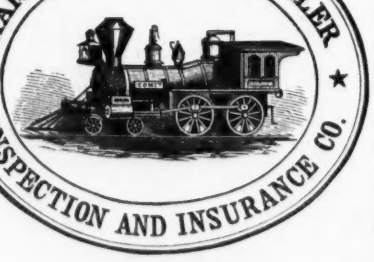

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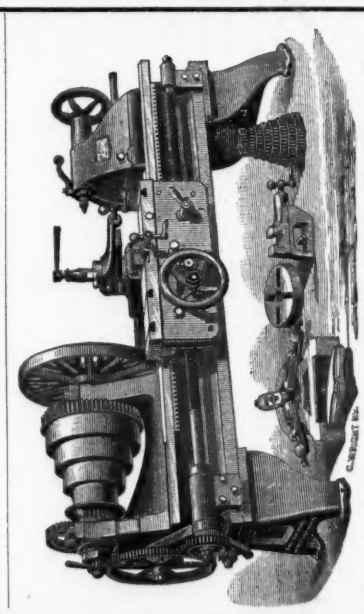

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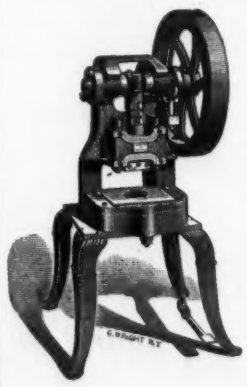

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